DOCUMENT RESUME

ED 223 456 SE 039 703

AUTHOR	Coon, Herbert L.
TITLE	A Collection of Ideas and Materials for Vocational Trainers. Water Quality Instructional Resources Information System. Monograph Series: Improving Instruction.
INSTITUTION	Ohio State Univ., Columbus, Ohio. Information Reference Center for Science, Mathematics, and Environmental Education.
SPONS AGENCY	Environmental Protection Agency, Washington, D.C. Office of Water Programs.
PUB DATE	Dec 81
GRANT	T-901184-01-0
NOTE	207p.; For related documents see ED 191 728, ED 205 368, and ED 215 900.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052) -- Reference Materials - General (130)
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	Adult Learning; Adult Students; Instructional Design; *Instructional Development; *Instructional Improvement; Instructional Materials; *Lesson Plans; Postsecondary Education; *Student Characteristics; Teacher Improvement; *Teaching Methods; Waste Water; *Water Quality; Water Treatment

ABSTRACT

A great variety and amount of teaching materials and methods related to water quality and other Environmental Protection Agency (EPA) concerns have been developed. Program developers/trainers responsible for instructional programs will find in ERIC and the Instructional Resources Information System (IRIS) enough material to organize dozens of short courses and/or hundreds of instructional hours. The problem is not lack of material but rather selecting and/or developing material that is most useful in a specific situation, achieves certain objectives, honors the needs and concerns of adult learners, and permits instructors to use materials/methods which capitalize on their teaching strengths. Cited in this document are ideas, materials, and methods that may be useful to persons involved in designing instructional programs for water quality or other EPA concerns. The first section provides characteristics of adult learners with related teaching implications. The second section focuses on teachers of adults. The third section (the major part of the document) focuses on various aspects of instructional planning and teaching, including sample lessons found in the ERIC and IRIS literature. Reference materials (with abstract and availability) are provided in the fifth section. EPA Instructional Resources Center (IRC) activities are described in the final section. (Author/JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED223456

EPA Information Dissemination Project
1200 Chambers Road - Third Floor
Columbus, Ohio 43212

Water

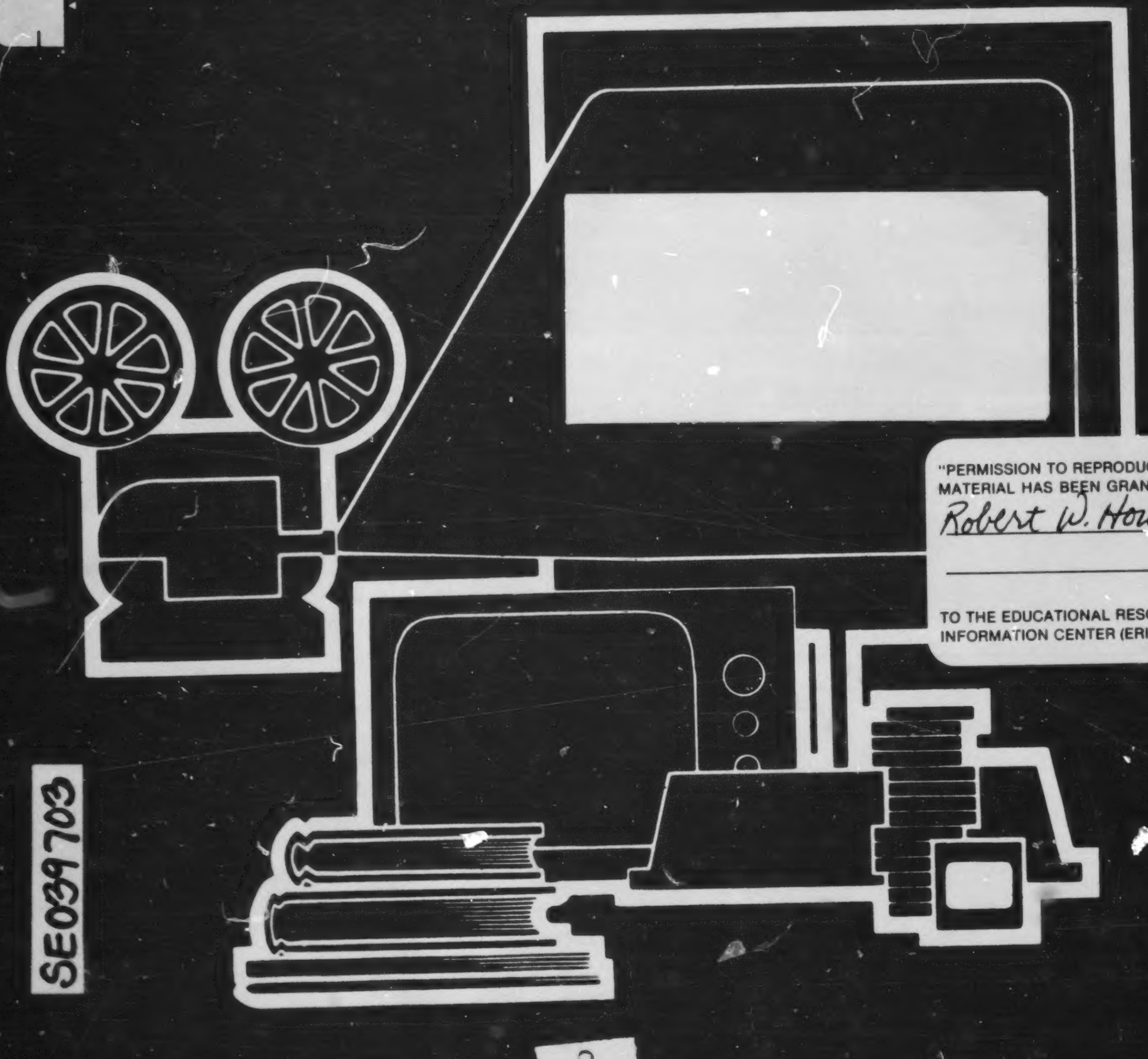
Water Quality Instructional Resources Information System

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.



"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Robert W. Howe

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SE039703

A Collection of Ideas and Materials for Vocational Trainers

prepared by

Herbert L. Coon

MONOGRAPH SERIES:
IMPROVING INSTRUCTION

as part of

Grant No. T-901184-01-0

EPA Instructional Resources Center
SMEAC Information Reference Center
1200 Chambers Road, Third Floor
Columbus, Ohio 43212

December 1981

This monograph has been reviewed by the U.S. Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of trade names of commercial products constitute endorsement of recommendation for use.

This project has been financed (in part) with Federal funds from the U.S. Environmental Protection Agency, Office of Water Program Operations, Washington, DC 20460, under grant identification number T-901184-01-0. The contents do not necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

4

FOREWORD

The EPA Instructional Resources Center is continuing the development of an Instructional Resources Monograph Series. The monograph series is an extension of the information provided in the Instructional Resources Information System (IRIS) for water quality.

This document is one in the Instructional Resources Monograph Series. These documents are designed to assist the professional in identifying and locating instructional and reference materials related to various technical aspects of water quality control. Emphasis is given to items useful in the development and presentation of wastewater treatment training programs.

Each monograph reviews an aspect of wastewater treatment, provides representative examples of available instructional materials, and includes an annotated bibliography, often with additional references. Previously published titles in this series include:

Clinton L. Shepard and James B. Walasek, Instructional Resources Monograph Series: Activated Sludge. EPA-430/1-80-008. September 1980.

Herbert L. Coon, Instructional Resources Monograph Series: Safety in Wastewater Treatment Systems. EPA-430/1-81-014. June 1981.

Robert D. Townsend, Instructional Resources Monograph Series: Anaerobic Digestion. EPA-430/1-81-017. August 1981.

Your comments and suggestions regarding this series are invited.

John F. Disinger
Coordinator, Water
EPA Instructional Resources Center

ABOUT THE AUTHOR

Herbert L. Coon is a Professor Emeritus in the Faculty of Science and Mathematics Education at The Ohio State University. Since 1973 he has been involved in developing and assembling learning resources for the ERIC Clearinghouse for Science, Mathematics, and Environmental Education. His experience includes directing numerous workshops aimed toward in-service education and curriculum development in this country and in overseas assignments.

CREDITS

Primary staff work for this publication was completed by Mrs. Linda S. Shinn, Mrs. Janice Hingsbergen, Dr. Robert W. Howe, and several graduate student assistants at The Ohio State University.

PREFACE

Designing instructional programs for personnel involved in water quality work is a difficult task. Students in such programs are likely to be adults with specific goals in mind; their reactions to teaching-learning situations often differ significantly from those of students who may be in school because of compulsory attendance laws or parental pressure.

Instruction related to water quality tends to focus on developing the specific understandings and competencies necessary to perform, at a satisfactory level, the work that must be done to assure safe and efficient operation of the system. At the entry level the student may desire instruction that will likely result in ability to pass the examination required for basic certification. Another student may desire instruction that will result, ultimately, in a higher level of certification. Other types of instruction, such as safety education, may involve many different kinds of levels of workers from a plant or system in a teaching-learning program deemed important to all. In each of these situations the student expects to find instruction that is useful or relevant to him NOW, not in some long-range future.

This concern of the adult vocational student for immediate usefulness and/or relevance of instructional materials has been a major factor in promoting development of lists of objectives (often behaviorally stated) which should be achieved during an instructional program. The extent to which these objectives should be developed by instructors (experts) alone or with input from the students after they have been assembled into a class with the instructor in an area on which curriculum developers disagree.

An enormous variety and amount of teaching materials and teaching methods related to water quality and other EPA concerns have been developed. Program developers or trainers responsible for instructional programs will find in ERIC and in Instructional Resources Information System (IRIS) enough material to organize into dozens of short courses and/or hundreds of hours of instruction. The problem is not lack of material but rather selecting and/or developing material which can be most useful in a specific situation; a situation which aspires to achieve certain objectives, which honors the needs and concerns of the students, and which permits the instructor to use materials and methods which capitalize on his teaching strengths.

Adult learners involved in pre-service or in-service vocational training programs are constantly making judgements regarding the value of their instruction and the effectiveness of their instructors. Efforts should be made by program developers and trainers or instructors to ensure systematic feedback from their concerned students.

Concerns such as those suggested above are well known to persons likely to be interested in this monograph. The following pages will attempt to cite from ERIC, IRIS, and other sources some ideas, materials, and methods that may be useful to persons involved in designing instructional programs for water quality or similar EPA concerns.

TABLE OF CONTENTS

Page

FOREWORD ii

THE ADULT LEARNER 1

TEACHERS OF ADULTS 19

INSTRUCTIONAL PLANNING/TEACHING 29

REFERENCE MATERIALS 165

EPA INSTRUCTIONAL RESOURCES CENTER 193

THE ADULT LEARNER

THE ADULT LEARNER

Students in EPA or other adult vocational training programs are typically high school graduates or older persons. In-service programs related to water treatment plants, wastewater treatment systems, pesticide application, air quality monitoring and similar programs may enroll persons of middle-age or even older.

Adults in many respects learn according to the same general principles applicable to children and youth. Educational literature suggests, however, that adult learning is different in degree if not in kind, from that of younger learners caused by characteristics such as the following listed by Sara R. Massey in a small bulletin, Staff Development: Teaching Adult Professionals:

1. Adults Make and Are Responsible for Their Own Decisions
2. Adults Are Experienced
3. Adults Are Verbal
4. Adults Are Achievement Oriented
5. Adults Are Judgmental

Adults in training programs are generally there because they choose to be. They have decided to be a part of the program because of employment opportunities clearly related to the training they will receive. They may be participating because promotion and higher pay require additional training. In any event, the trainee has made his own decision to be in the program and consequently comes with a strong commitment to succeed. He comes with a level of motivation likely to result in an interested, participating student.

Adults who have assumed responsibility for their own decisions are sometimes "caught" in tightly structured training programs. They identify with carefully outlined programs that move toward specific goals. But they still welcome a chance to choose among alternative ways to accomplish a task. They welcome the opportunity to help decide how some flexibility can be incorporated in the time schedule. They aspire to some freedom (which they may control) within an overall structure planned by the instructor or curriculum designer.

The fact that adults are more experienced than younger learners poses some teaching-learning problems. Starting a learning program with all students at the same level of ignorance permits the teacher to use, at least in the beginning, a structure that emphasizes common learning experiences. Teachers of a beginning Spanish class in French-speaking Montreal where class members know no Spanish face quite a different problem than that faced by a similar teacher in Miami, Florida or Las Cruces, New Mexico, where some students are likely to come from Spanish-speaking families.

Similarly the experiential base brought by vocational students to training programs varies widely. One student may have rebuilt an automobile engine while a classmate may be quite illiterate about tool usage. The student, illiterate with tools, may read at twelfth-grade level or higher; the experienced mechanic may have trouble reading sixth-grade material.

The trainer must recognize the enormous range of different experience backgrounds brought by students to his class. The trainer should attempt to use the unusual backgrounds and skills of his trainees as they may be incorporated into the ongoing training program. In any group of 15-30 adults, it is almost certain that one of these persons knows more than does the instructor about some aspect of the material they are studying.

Some adults with rich experience backgrounds find it difficult to identify with the need, or even the desirability, to understand the theory related to their experience; or the way in which theory is related to practice in the training program. The trainer is challenged to find the ideal balance of practical hands-on experience and related intellectual understandings (theory) which should be incorporated in a good training program.

Adults communicate primarily through oral expression. It is much easier to talk than to write. It is, despite the fact that many adults haven't learned to do it very well, easier to listen than to read. Curriculum designers and instructors need to plan and teach with these considerations in mind.

Instructors, like most other adults, tend to prefer to talk rather than listen. This tendency, plus the fact that they have a responsibility to "present material" to their trainees, often results in over-emphasis of the lecture method. Lectures without opportunity for verbal interaction with the listeners are a notoriously ineffective medium of instruction. Lectures that follow outlines previously given to students or which involve students in organized notetaking as the lecture is presented are considerably more effective.

Adults involved in training programs are often expected to learn the content presented in manuals or guides. This may involve very careful reading of material written in a technical style. The trainee with a preference to talk freely rather than to read carefully may profit from short periods of scheduled reading time. A 15-minute period of reading, followed by small group oral discussion, followed by group-instructor interaction may result in more learning than would reading or lecture alone.

Adults in vocational training programs are achievement oriented. They have made decisions to be in these programs, in part, because they expect to succeed.

Students enrolled in these programs welcome quick recognition of their achievements. College students may accept (reluctantly) the practice of waiting three months or longer to receive the instructor's assessment of their level of achievement in a course. Vocational students resent such delayed feedback on the quality of their work.

Fortunately vocational training programs can be organized into discrete modules, units, or lessons which can be studied or accomplished in short periods of time. Material can be presented and assessment of understanding can be tested almost immediately. Instructor demonstration of a skill. student practice to master that skill, and instructor evaluation of the level of student achievement of the skill constitute a learning package that may require only minutes of time. Adults who are achievement oriented find such arrangements very satisfying.

Adult learners because of greater maturity and a large background of experience from which to draw are more openly judgmental than younger persons. Adults, particularly in vocationally-oriented classes, are quick to judge the value of their educational program. This judgement may, at times, be in error regarding the importance of underlying theory or generalized intellectual understandings. The blunt, direct, manner used by some adult learners to criticize aspects of a training program may be upsetting to instructors. Especially to instructors whose teaching experience has been primarily with younger, more passive students.

Instructors, however, can profit from the willingness of adult learners to evaluate, critically, their learning experiences. Solicited feedback from students can identify program elements which they regard as particularly weak and also particularly strong. Such judgements may influence the ongoing instructional programs; such judgements clearly provide information which can be useful in planning future offerings of the program.

Instructors should be sensitive to some special concerns and limitations of older adults. Stronger lighting and larger type faced material may eliminate some problems associated with reading assignments. Since adult learners may be "rusty" in undertaking long reading projects the instructor may well consider short, frequent periods rather than fewer longer ones.

Some older adults have experienced a decline in hearing ability. Instructors for such persons should be especially conscious of the need to face the students while speaking and also to enunciate clearly while using a well-modulated voice.

Older learners appear to have a somewhat shorter attention span than do college age youth. Instructors, in their desire to present useful material, may schedule lecture or motion picture viewing sessions that are too long. Interest falls off rapidly after 40 minutes; continuous sessions of quiet intellectual activity longer than one hour are seldom a productive use of time.

The Wisconsin State Board of Vocational, Technical, and Adult Education has prepared a useful 25-page booklet, So You're Helping Adults Learn. Learning characteristics of adults together with teaching implications of these characteristics are presented as follows:

The teacher of adults needs to recognize the older learners sometimes have different characteristics than youthful learners. The noticeable changes in characteristics as the adult ages (18 through 80+) will most commonly relate to experience, motivation, physical decline, and interests (vocational, cultural, and leisure).

Some of the more common general characteristics of adults along with some teaching implications are presented on the following page.

	CHARACTERISTICS	TEACHING IMPLICATIONS
1.	Have the ability to learn in spite of the common misconception that oldsters cannot learn.	They need frequent assurance of this however, for some it will take a bit longer.
2.	Have opinions and want to express them.	This provides relevancy.
3.	Like to share their varieties of experiences.	They learn best if they are involved.
4.	Respond more favorably to praise.	An extremely important motivational device, but use it judiciously.
5.	Differ from one another.	More so than in a high school class in age, mental ability and education.
6.	Like informality and variety.	Set the tone and provide environment for this.
7.	Like to socialize.	Set times for coffee breaks and join in.
8.	Don't like to waste time.	Their time away from family and work is valuable.
9.	Learn best by doing.	Like activity, not dull lectures.
10.	Will drop out easily.	Have them experience success during the first few classes.
11.	Like to help set goals.	Learn best if they get immediate benefits.
12.	Like to learn at their own pace.	Provide individualized instruction.
13.	Want to be treated as adults and friends.	Be human.
14.	Learn best if a variety of teaching techniques are used.	Be imaginative.
15.	Prefer guidance over grades.	They fear public humiliation.
16.	Want to see immediate benefits.	Plan specific and practical situations.
17.	Want to know how they are doing.	Explain progress toward their chosen goals.

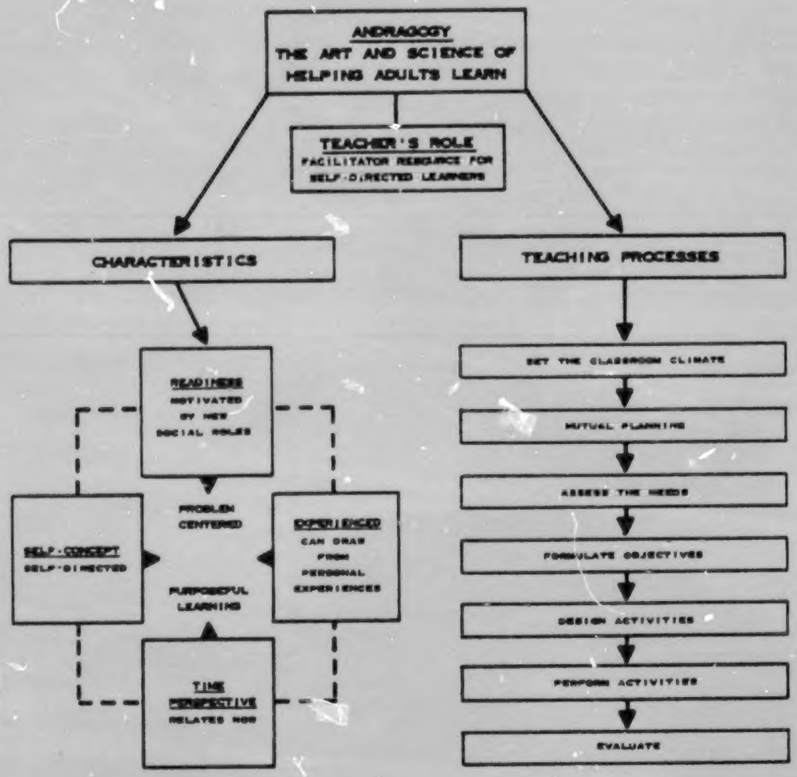
The Wisconsin booklet includes the following set of "tips to keep adults coming back" to classes or programs in which they are enrolled. Obviously the tips are simply characteristics and behaviors of a good teacher.

TIPS TO KEEP ADULTS COMING BACK

1. Have a sense of humor.
2. Learn names of the students early and use them.
3. Plan carefully and use short units.
4. Use a variety of teaching methods and audio-visual aids.
5. Have students evaluate class meetings from the start.
6. Avoid busy work.
7. Be enthusiastic.
8. Use "we" not "I."
9. Avoid arguments (they can arise from politics, unionism, religion).
10. Encourage and praise students' accomplishments.
11. Avoid embarrassing and belittling.
12. Adapt assignments to the level of their experience, vocabulary, and available time.
13. Be flexible.
14. Be tactful, tolerant, and cheerful.
15. Start and dismiss class on time.
16. Have business-like appearance.
17. Use daily problems of class members if they fit the discussion.
18. Avoid work mannerisms, poor posture, and fiddling with things.

The Wisconsin booklet includes, also, a useful model developed from the writings of a well-known authority in adult education. The model merits very careful analysis and subsequent implementation by persons seriously interested in offering good vocational programs for adults.

The following model has been developed from the writings of Malcolm S. Knowles,* as reported in So You're Helping Adults Learn. This model employs the term andragogy. The term, commonly used in Europe, describes adult education more adequately than the term pedagogy. Andragogy is defined as the "art and science of helping adult learners," whereas pedagogy is expressed as the "art and science of teaching children."


ANDRAGOGY
THE ART AND SCIENCE OF HELPING ADULTS LEARN
TEACHER'S ROLE
FACILITATOR RESOURCE FOR SELF-DIRECTED LEARNERS
CHARACTERISTICS
TEACHING PROCESSES
READINESS
MOTIVATED BY NEW SOCIAL ROLES
PROBLEM CENTERED
SELF-CONCEPT
SELF-DIRECTED
EXPERIENCED
CAN DRAW FROM PERSONAL EXPERIENCES
PURPOSEFUL LEARNING
TIME PERSPECTIVE
RELATES NOW
SET THE CLASSROOM CLIMATE
MUTUAL PLANNING
ASSESS THE NEEDS
FORMULATE OBJECTIVES
DESIGN ACTIVITIES
PERFORM ACTIVITIES
EVALUATE

---

*Malcolm S. Knowles, Modern Practice in Adult Education. Associated Press, 1970.

Material prepared by the National Center for Vocational and Technical Education includes a listing of adult characteristics which should be considered when working with them.

1. Adult students have in their minds a definite reason for being in your class.
2. Adults insist that the material you teach be relevant to their perceived needs.
3. Adults are likely to leave your class if they don't get what they came for.
4. Adults expect individual attention.
5. Adults often bring to vocational training programs a wide range of age, education, and experience backgrounds.
6. Adults may doubt their ability to learn new material.
7. Adults have not lost the ability to learn but their learning rate may be slowed down.
8. Adults fear failure.
9. Adults have strong likes and dislikes.
10. Adults have a stronger resistance to change than do younger persons.

S. Douglas Patterson and others developed for the Alabama State Department of Education, Division of Vacational Education, a 140-page bulletin entitled Performance-Based Adult Vocational Education.

The publication contains the following list of concisely stated expectations which the authors believe adult learners want from their instructors:

"Let me start where I am."

"Tell me what to expect."

"Tell me what you expect."

"Show me the big picture."

"Let me practice."

"Give me some variety."

"Give me some options."

"Don't hold me back, and don't rush me."

"Let me know how I'm doing."

"Give me a test, but don't threaten me with it."

Donald H. Brundage and Dorothy MacKeracher have written, for the Province of Ontario Department of Education, an extremely useful 134-page report, Adult Learning Principles and Their Implication to Program Planning.

The report includes insightful discussion on concepts or ideas which are then summarized in specific statements or learning principles. The serious student of adult vocational education will find many useful ideas in the summaries reproduced below.

Adults, in general:	Children, in general:
Adults have extensive pragmatic life experiences which tend to structure and limit new learnings. Learning focuses largely on transforming or extending the meanings, values, skills, and strategies acquired in previous experience.	Children have few pragmatic life experiences. Learning focuses largely on forming basic meanings, values, skills, and strategies.
Major pressures for change come from factors related to social and work roles and expectations, and to personal need for continuing productivity and self-definition.	Major pressures for change come from factors related to physical growth, to demands for socialization, and to preparation for future social work roles.
Learning needs are related to current life situations.	Learning needs are related to developing organized patterns for understanding future experience.
Adults are more likely to use generalized abstract thought.	Children are more likely to use specific, concrete thought.
Adults are likely to express their own needs and describe their own learning processes through verbal activities which allow them to negotiate and collaborate in planning their own learning programs.	Children are likely to express their own needs and learning processes through non-verbal activities, which leads to planning by "expert" observers and interpreters.
Adults have an organized and consistent self-concept and self-esteem which allows them to participate as a self separate from other selves and capable of acting independently of others.	Children have a relatively unorganized and inconsistent self-concept which allows them to perceive themselves as a self separate from, but dependent on, others.
Adults are assigned a responsible status in society, and are expected to be productive.	Children are assigned a nonresponsible status in society, and are expected to play and learn.

The Brundage and MacKeracher booklet includes a very useful listing of characteristics of adult learners. After discussion of each category the authors have developed "learning principles" related to that category. The 69 learning principles reproduced below offer many valuable insights to program developers and instructors of adults. Reading the scholarly discussion which precedes each set of principles is highly recommended for the serious student of adult education. Space limitation precludes inclusion of that useful material here.

A. PHYSIOLOGICAL CHARACTERISTICS (OF ADULTS)

Learning Principles

a) Adults learn best when they are in good health, are well rested, and are not under stress.

b) Adults learn best when their vision and hearing are in the best condition possible and when the learning environment can compensate for any loss of sensory acuity.

c) Adult learning is not directly related to changes in physical characteristics until after about age 40, except in the case of what might be called rehabilitative learning such as might follow illness or accident.

d) Adult learning after 40 often may be related to physical aging. The learning may be difficult to detect; for example, visual acuity may decline almost imperceptibly over a long period of time, and the techniques that adult develops in order to cope with the change may go unnoticed.

e) Adults do not learn productively when under severe time constraints. They learn best when they can set their own pace and when time pressures are kept to the minimum. The older they are, the more counter-productive time pressures become.

B. SELF-CONCEPT

Learning Principles

a) Adults enter learning activities with an organized set of descriptions and feelings about themselves which influence the learning process. The description is the self-concept; the feelings are the self-esteem.

b) A teacher working with adults needs to know how he personally conceptualizes adult learners as well as how the individual adult learners conceptualize themselves. In cases where the two conceptualizations are incongruent, the teacher should pay more attention to the learner's description of himself.

c) Adults with positive self-concept and high self-esteem are more responsive to learning and less threatened by learning environments. Adults with negative self-concept and low self-esteem are less likely to enter learning activities willingly and are often threatened by such environments.

d) Adults are more concerned with whether they are changing in the direction of their own idealized self-concept than whether they are meeting standards and objectives set for them by others.

e) Adults react to learning experiences or information as they perceive it, not as the teacher presents it.

f) Adults learn best when there are activities which allow them to organize and integrate new learnings into their self-concept.

g) The teacher of adults should be able to model behavior which is relevant to the role of learner. This includes: valuing the role of learner as an integral part of living and as important as work, social, and family roles; using learning-how-to-learn strategies; valuing and using one's own past experience as a resource for current learning; and valuing the role of learner as a responsible status within society.

h) Adults learn best in environments which provide trusting relationships, opportunities for interpersonal interactions with both the teacher and other learners, and support and safety for testing new behaviors.

C. EMOTIONS, STRESS, AND ANXIETY

Learning Principles

a) Adults learn best when they are stimulated, aroused, or motivated to an optimum level through internal or external sources.

b) Adults do not learn when overstimulated or when experiencing extreme stress or anxiety.

c) Adults have more, stronger, and longer emotional responses to change than do children.

d) Adults learn best in environments which provides trust relationships and freedom from threat.

e) Adults who enter into learning activities are often well-motivated and generally do not require further stimulation in the form of pressure or demands from the instructor or other learners. What they may require is assistance and support to channel their motives into learning rather than into self-defense.

f) Adults who are experiencing extreme stress or anxiety may communicate poorly and process information in ways which delete, distort, oversimplify, or over-generalize.

g) Stimulation or arousal can be channeled equally well into learning or into resistance to learning.

h) Stimulation or arousal can be labeled equally well as childish and immature behavior, or stress behavior, or as learning behavior depending on other aspects of the situation and the perceptions of the instructor.

i) Adults who can process information through multiple channels and have learned how to learn are the most productive learners.

j) Adults learn best when the content is personally relevant to past experience or present concerns and the learning process is relevant to life experiences.

k) Adults learn best when novel information is presented through a variety of sensory modes and experiences, with sufficient repetitions and variations on themes to allow distinctions in patterns to emerge.

l) Adults learn best through effective two-way communications which emphasize learner talking and self-reflecting and teacher listening and reflecting.

m) Adults have developed well-organized strategies for defending against threat, for covering emotional reactions. These may mask stress or anxiety but never completely alleviate it.

n) The consequences of learning can lead to disorientation and conflict which, in turn, can lead to further learning or can lead to increased stress and decreased learning.

D. PAST EXPERIENCE

Learning Principles

a) Adults learn most productively when the material being learned or the processes being used bear some perceived relationship to past experience, or when past experience can be applied directly to new situations.

b) Past experience presents the adult learner with a paradox. In the learning experience, the meanings, values, strategies, and skills based on past experience and forming part of the present self-concept are being changed. These changes may, in turn, damage or threaten the self-concept. At the same time, the self-concept must be a trusted agent in managing the learning process.

c) Adult learning focuses largely on transforming meanings, values, strategies, and skills derived from past experience. This process requires more energy and more time than learning based on formation of new learnings. It also requires that past experience be raised to the level of consciousness; that both figure and ground be examined for relationships; and that new behaviors be tested in safe and trusted environments.

d) The past experience of adult learners must be acknowledged as an active component in learning, respected as a potential resource for learning, and accepted as a valid representation of the learner's experience. Past experience can be both an enhancement to new learning and an unavoidable obstacle.

e) All adults do not necessarily possess all the meanings, values, strategies, and skills required for new learning activities. Acquisition of the missing components must be regarded as an essential activity in all learning experiences. Assessment of learner needs in this regard should be part of every adult learning experience and should concentrate on identifying each individual's strengths and weaknesses, since every individual will have unique past experiences.

f) Past experience can be most productively employed in current learning when divergent, non-sequential, non-logical cognitive processes, such as analogies and metaphors, are used to connect it to present experience.

E. TIME

Learning Principles

a) Adult learning focuses on the problems of the immediate present. Learning content should be derived from the learner's needs.

b) Past experience becomes increasingly important as an adult grows older. Its potential for helping or hindering the learning process also increases with age.

c) When learning focuses on problem-solving, the solutions must come from, or be congruent with, the learner's experience, expectations, and potential resources, rather than being prescribed by an "expert."

d) Adults tend to experience a need to learn quickly and get on with living. They are often reluctant to engage in learning activities or content which does not appear to be immediate and pragmatic application within their life.

F. MOTIVATION

Learning Principles

a) Motives are the felt needs with which a learner starts a learning activity. They may relate to unmet needs or unwanted conditions in life and to the pursuit of positive growth towards desired goals. As the learner proceeds toward meeting unmet needs, resolving unwanted conditions, or reaching desired goals, the motives for learning tend to change in relation to any feelings and experiences of success/failure and satisfaction/dissatisfaction.

b) Adults who begin with motives related to unmet needs or unwanted conditions within their life are likely to feel more threatened and to require more teacher support and structure and extensive assistance in clarifying and establishing their own directions and goals. This process of clarifying learning needs and goals contributes to feelings of satisfaction or dissatisfaction.

c) Once directions and goals have been clearly identified, behavioral objectives can be developed which will guide the learner and the teacher in seeking and giving feedback. This feedback contributes to feelings of success or failure. It also provides real information for the guidance of learning.

d) Success and satisfaction become reinforcers for learning and motives for further learning.

e) Teacher behaviors can contribute most productively to clarifying directions and specific objectives and to providing feedback; such behaviors lead to learner success and satisfaction. In this way, teachers can indirectly motivate learners to further learning. Teachers cannot directly motivate learners as they start learning experiences.

f) While adults have the verbal capability to clarify and specify their own learning needs, they are often reluctant to do so and may need assistance in the process.

G. PARADOX AS AN ESSENTIAL ASPECT OF ADULTHOOD

Learning Principles

a) As an adult learns, he needs to be able to cope with paradoxical situations in which change and stability, dependency and independency, are all required. In such situations, the adult needs to be able to use question-asking and -answering behaviors, problem-finding and -solving approaches, an openness to new information, and a willingness to make a decision or reach tentative closure. A diversity of behaviors is facilitated by an adult teacher who is also willing and able to remain flexible, open to alternatives, and tolerant of ambiguity, diversity, inconsistency, and instability rather than becoming defensive or angry.

b) The adult learner may respond to ambiguity and instability with increased anger and self-defense. Since ambiguity and instability are seen as necessary for learning, anger will often be a basic component of any learning activity.

H. LEARNING STYLES AND ABILITIES

Learning Principles

a) Adult learners each have individualistic learning and cognitive styles and mental abilities.

b) A group of adult learners will be heterogeneous in terms of learning and cognitive styles and mental abilities.

c) The teacher of adults must be willing and able to respond to each learning and cognitive style and must be aware of his own styles and of how these affect the processes he used to assist learners.

d) When a mismatch occurs between the learning/cognitive style of the learner and that of the teacher, the result is likely to be unsatisfactory to both.

e) For cognitive styles which involve a developmental process, there are two types of match between styles. One involves teacher and learner at the same level of development and results in satisfaction. The other involves teacher at one level higher than learner and results in development of the learner.

f) Cognitive and learning styles are value-neutral. There is no "one best way to learn."

g) Adults tend to be proficient at self-selecting those learning situations and teaching-learning interactions which best enhance their own learning/cognitive styles.

h) Learning activities are cyclical, sequential, and unidirectional in their natural order. Learning activities which defy this order are less productive.

i) Adult learners prefer to start with the learning activities they are most comfortable with and to avoid those they see as difficult.

j) Teachers tend to start teaching activities with their own preferred learning activity.

k) The starting activity will determine what the teaching preparation must focus on and what the remainder of the teaching activities will look like.

l) Adult learners and their teachers can share the responsibility for such teaching-related activities as providing input, creating learning experiences, directing activity, and deciding on directions and objectives.

m) Feedback can occur only after the learner has acted overtly. The later the action and feedback come in the learning activities and/or the farther apart the action and feedback are in time, the less likely it is that feedback will contribute to satisfaction and success.

n) Each cognitive/learning style is adaptive in some situations and dysfunctional in others.

o) Cognitive/learning styles are not related to intelligence, mental ability, or actual performance.

p) Overall mental ability generally declines with age after 50 years. Verbal ability does not decline and many even increase, but non-verbal performance does.

q) Age-related declines in mental ability occur in those aspects of mental functioning which are based on physical factors and which involve the transference of meanings, values, skills, and strategies from past experiences to apparently unrelated current experiences and to novel, unfamiliar situations. There is no age-related decline in those mental abilities which utilize direct application of existing meanings, values, skills, and strategies.

I. DEVELOPMENTAL STAGES AND TRANSITIONS

Learning Principles

a) Adult behavior is not fixed, but changes in response to both internal and external pressures.

b) The changes tend to follow basic patterns which are cyclical and involve: becoming aware of the need for change; changing in ways which result in positive outcomes; and consolidating and integrating changes into self and one's life.

c) The adult learner is more apt to be responsive to learning opportunities during the intervals between transition points in his development.

d) Adult learners have not all reached the levels of cognitive development predicted. Such non-attainment may be the result of obstacles within the environment and/or lack of specific experiences.

e) Adults may also regress from previously attained levels of cognitive development because of environmental pressure to function at a lower level.

f) Adults are highly motivated to learn in areas relevant to their current developmental tasks and transitional phases.

g) Adults tend to enter new experiences in dependent modes of behavior and to change in response to their own definition of themselves as functioning actors in their situation and in response to environmental expectations and reinforcements.

TEACHERS OF ADULTS

TEACHERS OF ADULTS

The successful teacher of adults is a person who is "in tune" with the characteristics of adult learners such as those discussed in the previous section. Brundage and MacKeracher, in Adult Learning Principles and Their Application to Program Planning, state, "Adult learning is facilitated by a teacher whose self-concept and self-esteem are positive and who is able to remain flexible and responsive in situations which might involve anxiety and stress." They also believe "The interpersonal interaction between the adult learner and the adult teacher is facilitated by a teacher who is aware of how he behaves in such relationships; who is accountable, committed, open, and responsive to the learner; and who values and respects both himself and the learner."

An Australian study of adult learning, Tertiary Teachers Learning About Learning, indicated that good teachers of adults demonstrated the following behaviors:

1. Willingness to be flexible, to be direct or indirect as the situations demand.
2. They seem to have more positive views of others: students, colleagues.
3. They favor democratic class procedures.
4. The ability to see things from the other person's point of view.
5. They do not look at students as persons "you do something to" but rather as individuals capable of doing for themselves once they feel trusted, respected, and valued.
6. The teacher genuinely cares for the students and expresses his feelings.
7. Provides definite study helps.
8. Assumes a conversational manner in teaching.

The New York State Education Department's Handbook for Teachers of Adult Occupational Education, contains two checklists which are useful in identifying good adult teachers. An "instructor self-evaluation checklist," reproduced below, specifies a series of teacher behaviors of characteristics which affect teacher-learner relationships. Instructors, and their supervisors, can use this list to identify instructor areas of strength and weakness.

The "instructor checklist," also shown below, provides students with an opportunity to judge the strengths and weaknesses of their instructors. Student assessment combined with conscientious instructor self-evaluation should provide insights which can result in better teachers for adult vocational programs.

INSTRUCTOR SELF-EVALUATION CHECKLIST

Directions: Place a check in the appropriate column that best describes your actions for each item. Areas in need of improvement will be identified by the checks found in the first two columns. Develop a plan of action to upgrade these items.

KNOWLEDGE OF SUBJECT	Bluffs	Superficial	Thorough
PLANS FOR PRESENTATIONS	Seldom	10 min. before class	Well prepared
SPEECH PATTERNS	Mumbles	First few rows can hear	Speaks clearly
USE OF TERMINOLOGY	Doesn't know terms	Doesn't explain terms	Teaches vocabulary
SYMPATHY AND PATIENCE	Short tempered	Puts up with students	Really cares about students
TACT AND DIPLOMACY	Abrupt and abrasive	Can be lived with	Congenial
DISCIPLINE	A pushover	Inconsistent	Firm but fair
COMPLIMENTS STUDENTS	Seldom	Occasionally	Whenever earned
CORRECTS STUDENTS	Gruffly	Coldly	Tactfully
QUITS TALKING	Once in a while	Can be interrupted	Knows when to stop and listen
ENCOURAGES QUESTIONS	After I'm through	Can be interrupted	Teaches students to ask
EVALUATES STUDENTS	As punishment	Because required	To measure progress
COOPERATES WITH OTHERS	If made to	As required	Seeks ways willingly

INSTRUCTOR CHECKLIST

Directions: For each item listed, place a check in the appropriate column that best describes, in your opinion, the instructor. Be honest but not vindictive.

	Items	Satisfactory	Needs Improving
1.	Knows subject throughly	____	____
2.	Gives presentations that are well organized	____	____
3.	Presents occupationally oriented materials	____	____
4.	Speaks clearly	____	____
5.	Explains the language of the trade	____	____
6.	Shows concern and patience for students	____	____
7.	Uses tact and diplomacy when dealing with students	____	____
8.	Exercises proper control over learning activities	____	____
9.	Praises good work and accomplishments	____	____
10.	Corrects students' mistakes tactfully	____	____
11.	Encourages students to ask questions and to participate in lessons and demonstrations	____	____
12.	Uses a variety of teaching methods	____	____
13.	Gives clear and concise explanations and demonstrations	____	____
14.	Maintains a neat and orderly classroom and/or shop	____	____
15.	Shows a concern for the safety of the students and equipment	____	____
16.	Keeps tools and equipment in good operating condition	____	____
17.	Maintains adequate supplies on hand	____	____

Sara R. Massey, in *Staff Development: Teaching Adult Professionals*, lists some generalizations about learning, teaching, and curriculum which merit serious reflection. The material designed originally for workshop planners and instructors is applicable, also, to other aspects of adult education. Quite clearly Massey approaches teaching-learning from a humanistic point of view.

Her observations of the learning process are presented as follows:

THE LEARNING PROCESS

1. EXPLORATION	Participants need an opportunity to get acquainted with the content. Think of exploration as getting participants to view the goods before the auction starts rather than just waiting for them to be put up, one by one. Participants can look at materials, skim articles, generate questions, or share opinions with others. Participants need time to get involved with the content in their own way if useful learning is to occur.
2. INTERACTION	Participants' own experiences, feelings, attitudes form the base for the most important learning experiences. Interaction is a way of removing participants from their relative isolation, getting input from other perspectives, and furthering thinking. Variable grouping patterns--between friends, strangers, pairs, small group, large group--are necessary to encourage the most productive interaction.
3. ACTIVE PARTICIPATION	Twenty minutes is as long as most of us can sit in one place without fidgeting. Even concerts have intermissions. The need of all participants for physical movement and use of senses is often forgotten in adult learning. Just changing groups provides some movement. Activities which demand active listening, rather than passive listening, will increase the alertness and, therefore, learning of most groups.
4. REFLECTION AND ARTICULATION	Reflection must remain open-ended with no exception of "right" or "wrong" responses and serve as a vehicle for clarification and understanding. A do-stop-think process is necessary to make sense of activity that can otherwise be perceived as isolated and useless. Reflecting and articulating by participants on what, how, and why of the activity raise learning from the unconscious to a conscious level.

5. SYNTHESIS OR INTEGRATION	Time is most often the major factor in synthesizing and it cannot be programmed to occur. For participants to integrate new learning with what they already know, a task or assignment to be done later is helpful. Comparing past with present also furthers this process. Without synthesis, each new technique, skill, or concept becomes just one more "innovation."

The learning process must then be integrated with the specific content to be learned. Workshop content can be organized in the following manner:

THE CONTENT OF LEARNING

AWARENESS:	Awareness sessions are usually introductions to a concept or technique. Participants rarely learn skills here but should leave the session with the information necessary for deciding whether they want to know more or whether the information presented could be useful in their work. Such sessions should be short--2 hours at most--and exploratory in nature.
SKILLS:	Participants should leave a skill session with at least one new skill. Trainer demonstration and participant practice with leadership shifting from the trainer to the participants is a common sequence. The length of the session depends on the complexity of the skill, but participants must leave knowing what they have learned.
TRANSFER OF SKILLS:	Learning a skill and trying it out on the job are two different activities. A "transfer" session best directly follows a skill-learning session. Providing both activities eliminates premature judgements like "my students won't do this," "this is dumb" or "I don't see how this will help in my work." Participants need to separate themselves as learners from themselves as workers and be given a safe situation to try out the skill. Then problems can be discussed on the basis of real experience.

KNOWLEDGE:	Knowledge sessions include facts, theories, concepts, ideas. The most successful knowledge sessions include exploration, participation in short experiments, structured observations, and reading interspersed with a number of structured reflections. The lecture that holds the attention well enough or long enough to achieve understanding is possible, but rare.
ATTITUDE:	Changing or developing attitudes is hard and at best can only occur through very intensive learning experiences over a 5-day period or over a very long time period with less intense instruction.

A workshop director, according to Massey, needs to function as a skillful "moderator." The skills she has identified as important in the following chart for workshops leaders or moderators are equally applicable to teachers of other types of adult education programs. As indicated earlier in this monograph, adults tend to be verbal; they seek opportunities to share relevant experiences.

Adult educators would be well advised to develop discussion leader skills suggested by Massey.

SKILLFUL MODERATORS KNOW HOW TO	
1. INITIATE DISCUSSIONS	Good discussions are sparked by key questions or statements that engage the person's imagination to relook, to see differently, or to connect new points.
2. PROVIDE INFORMATION	Too many discussions occur in a vacuum without a focus point, a place to begin, and no input to keep them moving. The leaders seem to be saying, "I really don't know anything. What do you think?" A good moderator knows what information, how much, and when to give it to further the exploration of the participants.
3. ENCOURAGE PARTICIPATION	Discussions are structured to ensure all the opportunity to participate. Techniques to do this include: 1-1 rotating concentric circle, questions on cards, collected and read by another person, oral completion of open statements around the room, small groups with specific open topics, etc.

4. SET NORMS	There should be clear expectations for the discussion process: key points are written down, important information is shared, information is summarized, and all contributions are treated with respect.
5. HARMONIZE DIFFERENCES	Differences of opinion and different perceptions are the essence of discussions but the value of the discussion lies in finding the common goal, sorting the points of disagreement, focusing on the various answers, and keeping the group moving together toward the common goal.
6. COORDINATE THE INFORMATION	Links and connections must be made between speakers to keep the discussion focused and moving. The value of each person's contribution is in the relating of separate points to form the total.
7. SUMMARIZE THE DISCUSSIONS	If the time spent in discussion was of any value, there must be key points or something of importance which adds to the learning of participants. This needs to be clearly and concisely stated by someone.

The importance of moderator's skills in leading discussions cannot be overemphasized. People talk about "leader style," but the nitty-gritty of this style seems to be the way we conduct the "talk flow" of workshops. Through the talk, participants feel that they are involved, that they are heard and respected, that what they contribute is important, and that we all had a part of the learning.

The following suggestions may be useful to keep in mind as the leader and person responsible for workshop "talk."

GENERAL SUGGESTIONS FOR GROUP DISCUSSIONS

---

1. In leading a discussion, remember a discussion is not just a conversation. Many conversations are rambling and formless, jumping from topic to topic--and they may be enjoyable just because of this. A discussion, by contrast, should be more focused and directed to a specific topic. It is your job to ensure that the discussion remains relevant, and that rambling is minimized.

2. In discussions personal experiences are valuable--but beware of their becoming *too* personal. Some participants may be tempted to use the discussion as a confessional. If you permit this to develop, the result can be very difficult emotional situations, which have little learning value. It is best to nip this tendency in the bud. Be polite and empathetic, but firm. Later, in private, listen but don't waste the time of the total group.

3. Aim at achieving balanced participation from the group. Some people may want to "say their piece," but often many in the group are not interested in such speeches. Try to go through the session in a relaxed, yet purposeful style, without prolonging the session for the entire group. Change the grouping format to create different interaction patterns.

4. Remember that role plays and games, case studies, and written exercises are valuable primarily in setting the stage for the related discussions. Therefore, make sure that sufficient time is left for these discussions and that the questions are focused and directed to a specific topic.

INSTRUCTIONAL PLANNING/TEACHING

General Concerns

Vocational programs are generally planned to produce desired behaviors in trainees. Courses of study may be developed in terms of specific behavioral objectives. Content and method to achieve and measure achievement of these objectives may be specified to the point where little flexibility is available to the instructor or his students as they pursue a course of study.

While a case can be made for planning courses, short courses, or workshop within a framework of behaviorally-stated objectives, it may be useful to review the beliefs behind such an approach. Beliefs behind educational planning based on humanistic values will also be reviewed briefly.

M. H. Hassan of Western Illinois University, in A Complemental Approach to Instructional Development, suggests that curriculum designed in behavioristic terms rests on the following propositions:

1. Improvement of instruction involves the redesign of learning experiences. This includes the manipulation and control of learning conditions, delineation of specific learning tasks and sequencing of these tasks.
2. Terminal objectives should be specific and stated in measureable terms.
3. Accurate evaluation is essential to assess students' achievement.
4. Specific learning tasks can be broken down into components parts.
5. The use of more and different media and technologies can improve learning effectiveness and efficiency.
6. Systems approach can provide better management of instruction and other related functions.
7. Prepackaged or canned instructional programs can provide for individualized learning.

Hassan continues, "having described the behavioristic approach, I should like to share with you its methods. The system includes the three major steps or stages common to all systems: problem identification, software development and evaluation."

TABLE 1

Instructional Development System

STAGE I: DEFINE

IDENTIFY PROBLEM	ANALYZE SETTING	ORGANIZE MANAGEMENT
Assess needs	Audience	Tasks
Establish priorities	Conditions	Responsibilities
State problem	Relevant resources	Time lines

STAGE II: DEVELOP

IDENTIFY OBJECTIVES	SPECIFY METHODS	CONSTRUCT PROTOTYPES
Terminal	Learning	Instructional materials
Enabling	Instruction	Evaluation materials
	Media	

STAGE III: EVALUATE

TEST PROTOTYPES	ANALYZE RESULTS	IMPLEMENT/RECYCLE
Conduct try-outs	Objectives	Review
Collect evaluation data	Methods	Decide
	Evaluation techniques	Act

"So far I have established a direct link between operant conditioning and the behavioristic approach to instructional technology. I have presented to you their seven propositions to improve instruction, and a generalized system showing how the process of development is practiced. What I did not say is that a system or a process like this can hardly be faulted. The criticism, indeed, is directed toward the way it is formulated and how the process is carried out."

CRICITISM OF BEHAVIORISTIC APPROACH The behavioristic approach has drawn challenges and criticism from educators, scientists, psychologists and humanitarians. Hassan provides a sample:

1. The approach assumes that the classroom teacher is at fault.
2. The subject matter or cognitive domain is considered to be more important than the student.
3. The approach is overly simplistic at best; it ignores complex and meaningful human learning.
4. Controlled learning environments such as study carrels (some called them pigeon-conditioning boxes) do not allow for needed interaction among students.
5. The mere carryover of technologies from military, industry and business to education has proved costly and unsuccessful.
6. The system is designed to reach and teach the masses.
7. The system is incapable of accommodating social and conceptual changes.

Hassan suggested that curriculum designed in humanistic terms is based on the following propositions:

1. All persons have a natural inclination to want to learn.
2. People will only learn and retain what is personally relevant to them.
3. Learning the process of learning is a most socially useful tool.
4. Optimum learning occurs when the individual participates responsibly.
5. Self-evaluation and self-criticism are of primary concern in education.
6. The student must participate in her/his education as a major decision maker.

The following are offered as challenges and criticisms of the humanistic approach to curriculum building:

1. The approach has been described as global and subjective.
2. That it lacks empirical support.
3. That its objectives are broad-based and do not lend themselves to scrutiny.
4. The approach is more of a philosophical reaction to behaviorism.
5. Students do not possess the expertise to decide on educational objectives.
6. Evaluation is typically subjective.

This writer agrees with Mr. Hassan's conclusion that the behavioristic approach and the humanistic approach to curriculum building are not mutually exclusive. Who can disagree with the humanistic proposition that "optimum learning occurs when the individual participates responsibly?" Who can disagree with the behavioristic proposition that "the use of more and different media and technologies can improve learning effectiveness and efficiency?" The curriculum designers and the classroom instructors challenge therefore, is to meld the two approaches at points where this can be done for the students' benefit. Involving selected students in presenting class demonstrations of skills or behaviors to be mastered by all trainees appears to be a teaching strategy which accomplishes both behaviorist and humanistic objectives.

Curriculum developers may find useful the following material excerpted from The Utilization of Grounded Theory to Identify Instructional Design Elements In Adult Education Programs, by Robert L. LaGow.

In general, models of instructional development can be grouped into three major classes:

1) Administrative Model -

Primary emphasis on the efficient allocation of resources both human and material.

2) Psychological Theory -

Based on theories of how people learn. Emphasis on the individual as learner.

3) Evaluation -

Focus on precision objectives, evaluation of first results.

However, all of the models contain elements of the others such as:

a) a reliance on clear objectives;
b) an orderly, logical progression of events; and
c) evaluation of the final product generated by the system.

Of the three forms or models, the Psychological Theory is perhaps best, especially when merged with concerns highlighted in the other two models. This design system is well summarized by Gagne and Briggs in their book, Principles of Instructional Design*, as quoted by LaGow:

Steps in Instructional Design
Gagne & Briggs (1974)

1. Analysis and identification of needs.
2. Definition of goals and objectives.
3. Identification of alternative ways to meet needs.
4. Design of systems components.
5. Analysis of (a) resources required, (b) resources available, (c) constraints.
6. Action to remove or modify constraints.
7. Selection of development of instructional materials.
8. Design of student assessment procedures.
9. Field testing: formative evaluation and teacher training.
10. Adjustments, revisions and further evaluation.
11. Summative evaluation.
12. Operational installation.

Perhaps adapting from such a system Knowles suggests for adult education that the steps are (in terms of program development):

1. The establishment of a climate conducive to adult learning.
2. The creation of an organizational structure for participative planning.
3. The diagnosis of needs for learning.
4. The formulation of directions of learning (objectives).
5. The development of a design of activities.
6. The operation of the activities.
7. The rediagnosis of needs for learning (evaluation).

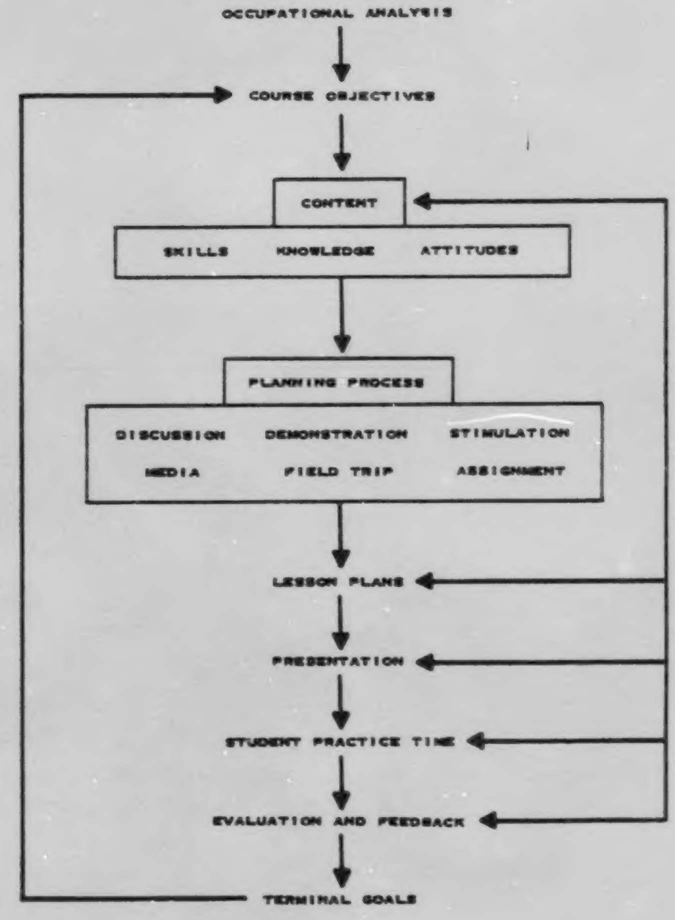
*Robert M. Gagne and Leslie J. Briggs, Principles of Instructional Design. Holt, Rinehart, and Winston, 1974.

The Knowles process for learning activity development is:

1. Setting a climate for learning.
2. Establishing a structure for mutual planning.
3. Diagnosing needs for learning.
4. Formulating directions (objectives) for learning.
5. Designing a pattern of learning experiences.
6. Managing the execution of the learning experiences.
7. Evaluating results and rediagnosing.

Persons responsible for planning or teaching a course of study may find useful the following diagram. (From Handbook for Teachers of Adult Occupational Education.)

DEVELOPMENT OF A COURSE OF STUDY


OCCUPATIONAL ANALYSIS
COURSE OBJECTIVES
CONTENT
SKILLS
KNOWLEDGE
ATTITUDES
PLANNING PROCESS
DISCUSSION
DEMONSTRATION
STIMULATION
MEDIA
FIELD TRIP
ASSIGNMENT
LESSON PLANS
PRESENTATION
STUDENT PRACTICE TIME
EVALUATION AND FEEDBACK
TERMINAL GOALS

A few comments on the above diagram may be appropriate.

The occupational analysis should include not only "theoretical" type analysis and input from persons such as engineers, time study specialists, professors, or others who are knowledgeable about the area to be taught. Equally important is input from technicians or other personnel who are actually performing the tasks to be taught to trainees.

The diagram suggests course objectives in terms of skills, knowledge, and attitudes. It is well to remember that attitudinal objectives are often achieved through the teaching methods used by the instructor to accomplish behavioral objectives in the skills development area. But it is also well to remember that knowledge (facts) which are not related to ongoing meaningful experiences are often regarded as useless by vocational students.

The diagram suggests the planning process include a variety of instructional methods; it implies a warning to the instructor not to rely too heavily on any single method, particulary lectures.

Lesson plans which detail presentation methods to be used to teach content to accomplish course objectives are shown as a critical component. Carefully made lesson plans are of utmost importance. Adequate student practice time, too, must be provided if behavioral objectives in the skills area are to be accomplished.

Finally, evaluation must be employed to measure achievement of terminal goals. Evaluation should include a feedback component designed to get student input regarding both content and teaching methods. It should be noted that the evaluation is not limited to the final phase of a course of study. It should be an ongoing process with many opportunities for student input.

Lesson Planning

The Handbook for Teachers of Adult Occupational Education includes an excellent section on lesson planning. Experienced as well as novice instructors can profit from careful reading and application of ideas presented in the extensive quotation which follows:

> Before any large job is undertaken a plan of action is developed. Before you teach a lesson you need a plan of action; this is called a lesson plan. A lesson plan provides the orderly procedures for teaching a lesson efficiently. It need not be long (one or two pages), but should be complete and practical. It may be written in topic or sentence form, and should provide for all situations that may arise. A lesson plan gives the new instructor confidence that he or she has prepared the lesson adequately. It also provides a last-minute substitute instructor with an idea of what must be done.
>
> The importance of daily planning cannot be overemphasized for it is almost impossible to be an effective instructor without preparation and planning. Part of the planning procedure is mental and part is written. The written lesson plan serves as a guide to move the learning along in an orderly fashion. A series of lesson plans form an important part of your course.

With experience, lesson plans become easier to develop and less detailed. The lesson plan results from an analysis of the material related to the information being presented and from the selection and organization of the specific content desired. The objectives should be determined, and then the necessary content selected, to accomplish the stated objectives. The content should be listed in the best order for learning within the time allowed.

Lesson plans are useful because they:

- Plan for a smooth transition from previous lessons to new material.
- Ensure sequential and adequate presentation of material.
- Offer time controls.
- Provide for proper use of methods, aids, and equipment.
- Establish a record of material presented and training accomplished.
- Serve as a guide to the instructor so important points are not omitted.
- Help to avoid attempted detours by students.
- Provide for individual differences.

THE MAIN PARTS OF A LESSON PLAN INCLUDE:

- Topic
- Objectives
- Time required
- Teaching methods and procedures
    - Telling and showing through a variety of methods
    - Guiding through supervision
    - Directing by pointing the correct way
    - Training to form habits or impart proficiency by practice
    - Instructional aids
    - Questions for checking and review
    - Assignment and references

The lesson plan is your guide and script. It should be flexible to accommodate interruptions, questions, and the lack of understanding on the part of the learners. Departure from the written plan can be expected as the students fail to understand some phase of the work, become especially interested in a particular part of the lesson, or contribute to the lesson from their own experiences. Sometimes a teaching plan may be used again with only minor revisions to adjust to changing needs and situations.

Many places have their own forms for lesson plans which the teachers must use. See your director or curriculum coordinator for any suggestions relative to the type of lesson plans you are expected to use in your situation. In case you have to use your own, consider the sample found on page 40.

The key to any lesson is the objective. State each objective in terms of what the students will be able to do as a result of your instruction. In other words, what can your students do after the lesson that they couldn't do before? What changes in student behavior were you able to bring about? This information will help explain why you are presenting the lesson, why the lesson is important to the students, and how to recognize when the desired changes or results have been accomplished. If you are not sure what to expect as a result of your instruction, you are less likely to be able to know if it happened.

When you state that, "Students will acquire an appreciation of ...," "an understanding of ...," or "a working knowledge of ...," you are not saying much more than words because it would be difficult to test for such a change. However, when you state that, "Upon completion of the instruction, the students will be able to remove and replace the wheel and tire of a 1932 Duesenberg SJ automobile in 15 minutes," the only fair thing to do is to show them how to do it, give them time to practice the task, and then test them to see if, in fact, they can do the job in 15 minutes.

A performance objective clearly describes:

- What the students will be able to do after a specific period of instruction.
- The conditions under which the students will do the task.
- The standard or measure of performance that will be used to determine when they have accomplished the task.

Think of the simplest thing that you can have our students do that will begin to meet their needs, provide them with a challenge, and at the same time give them an opportunity to experience success as they learn that first topic in your outline. Identify that task and you are on your way. The rest goes together easily.

For the instructional portion of the lesson, many teachers use the four-step method which includes:

- Preparation
- Presentation
- Application or practice
- Evaluation

The four-step method of instruction:

- Encourages an orderly organization of the teaching sequence.
- May be adjusted to accommodate for individual needs.
- Is flexible and allows for a variety of circumstances that might occur during the presentation.
- Is acceptable to most educators.

Richard Sheldon, in Handbook for Teachers of Adult Occupational Education, offers the following summary of elements involved in good teaching:

Getting ready to teach includes:

- Selecting the topic.
- Determining time required for the presentation.
- Establishing objectives (stated in terms of student accomplishments).
- Dividing the lesson into understandable parts.
    - Listing important steps.
    - Identifying key points.
- Developing the lesson plan following the four-step method of instruction.
- Assembling everything (tools, equipment, materials, teaching aids) that is needed and seeing that it is ready for use.
- Arranging workplace in proper order to do the job.

The teaching process includes:

- Preparation
    - Putting the students at ease.
    - Stating the job and finding out what students already know about the topic.
    - Arousing students' interest in the lesson.
    - Showing why students need the information.
- Presentation
    - Using a variety of methods to explain the information or operation.
    - Instructing slowly, clearly, and patiently--one point at a time.
    - Progressing from known material to new information, and from the simple to the complex.
    - Encouraging questions to clarify key points.
    - Being sure students are getting the information.
- Application
    - Having students practice the task or use the information successfully.
    - Correcting errors made by students.
    - Asking students to explain key points.
    - Making sure students understand the information.
- Evaluation
    - Testing to see if students have learned the information or are able to do the skill taught.
    - Putting students on their own with supervision gradually tapering off.
    - Checking progress of students frequently.

SUGGESTED LESSON PLAN FORMAT

Date Prepared: Date Presented:

Topic:

Objective(s):

Tools, Equipment, and Supplies Needed:

Teaching Aids:

Preparation of Students

Presentation of Information

Topical Outline or Steps	Key Points (things to say or do to make the teaching more effective)

Application (Practice by students)

Evaluation (Meeting trade standards)

Lead into Next Lesson (Assignment)

The State Education Department, Bureau of Occupational Education Curriculum Development. Handbook for Teachers of Adult Occupational Education. Albany, New York. 1977.

Material prepared by the National Center for Vocational and Technical Education includes a list of "questioning techniques" which may be useful to instructors. The list, slightly modified, is as follows:

1. Avoid calling on students in a clearly discernible pattern.
2. Usually state the question before naming a student.
3. "Draw out" answers rather than give them yourself.
4. Avoid questions which can be answered "yes" or "no."
5. Phrase questions so clearly that students need not ask to have them rephrased.
6. Repeat the answers to only important questions; avoid the practice of confirming every answer.
7. Raise questions which go beyond textbook materials.
8. Use a different questioning approach from the one used in the preceding meeting of the same group.
9. Avoid questions so phrased that they give away the answers.
10. Precede each question by a situation thoroughly understood as the basis for the problem involved.
11. Use questions to point up the important aspects of the lesson.
12. Plan the general outline of questions in advance.
13. Adapt questions to the ability and experience of the student for whom it is intended.
14. Direct confidence-building questions to timid students.
15. Give students time to think before requiring answers.
16. Allow students time to answer without interruption.
17. Generally, commend students for good answers.
18. Make it possible for students to raise questions.
19. Make sure questions teach rather than test.

The National Center for Vocational and Technical Education has prepared 100 instructional modules designed to develop the competencies needed by successful vocational teachers. The modules, ranging in size from about 35 to more than 60 pages, are available from the American Association for Vocational Instructional Materials, 120 Engineering Center, Athens, Georgia 30602, Telephone (404) 542-2586. The modules range in cost from $1.55 to $5.00. The entire set costs $242.49.

The complete list of module titles follows:

Titles of The Center's Performance-Based Teacher Education Modules

Category A: Program Planning, Development, and Evaluation

A–1 Prepare for a Community Survey
A–2 Conduct a Community Survey
A–3 Report the Findings of a Community Survey
A–4 Organize an Occupational Advisory Committee
A–5 Maintain an Occupational Advisory Committee
A–6 Develop Program Goals and Objectives
A–7 Conduct an Occupational Analysis
A–8 Develop a Course of Study
A–9 Develop Long-Range Program Plans
A–10 Conduct a Student Follow-Up Study
A–11 Evaluate Your Vocational Program

Category B: Instructional Planning

B–1 Determine Needs and Interests of Students
B–2 Develop Student Performance Objectives
B–3 Develop a Unit of Instruction
B–4 Develop a Lesson Plan
B–5 Select Student Instructional Materials
B–6 Prepare Teacher-Made Instructional Materials

Category C: Instructional Execution

C–1 Direct Field Trips
C–2 Conduct Group Discussions, Panel Discussions, and Symposiums
C–3 Employ Brainstorming, Buzz Group, and Question Box Techniques
C–4 Direct Students in Instructing Other Students
C–5 Employ Simulation Techniques
C–6 Guide Student Study
C–7 Direct Student Laboratory Experience
C–8 Direct Students in Applying Problem-Solving Techniques
C–9 Employ the Project Method
C–10 Introduce a Lesson
C–11 Summarize a Lesson
C–12 Employ Oral Questioning Techniques
C–13 Employ Reinforcement Techniques
C–14 Provide Instruction for Slower and More Capable Learners
C–15 Present an Illustrated Talk
C–16 Demonstrate a Manipulative Skill
C–17 Demonstrate a Concept or Principle
C–18 Individualize Instruction
C–19 Employ the Team Teaching Approach
C–20 Use Subject Matter Experts to Present Information
C–21 Prepare Bulletin Boards and Exhibits
C–22 Present Information with Models, Real Objects, and Flannel Boards
C–23 Present Information with Overhead and Opaque Materials
C–24 Present Information with Filmstrips and Slides
C–25 Present Information with Films
C–26 Present Information with Audio Recordings
C–27 Present Information with Televised and Videotaped Materials
C–28 Employ Programmed Instruction
C–29 Present Information with the Chalkboard and Flip Chart

Category D: Instructional Evaluation

D–1 Establish Student Performance Criteria
D–2 Assess Student Performance: Knowledge
D–3 Assess Student Performance: Attitudes
D–4 Assess Student Performance: Skills
D–5 Determine Student Grades
D–6 Evaluate Your Instructional Effectiveness

Category E: Instructional Management

E–1 Project Instructional Resource Needs
E–2 Manage Your Budgeting and Reporting Responsibilities
E–3 Arrange for Improvement of Your Vocational Facilities
E–4 Maintain a Filing System
E–5 Provide for Student Safety
E–6 Provide for the First Aid Needs of Students
E–7 Assist Students in Developing Self-Discipline
E–8 Organize the Vocational Laboratory
E–9 Manage the Vocational Laboratory

Category F: Guidance

F–1 Gather Student Data Using Formal Data-Collection Techniques
F–2 Gather Student Data Through Personal Contacts
F–3 Use Conferences to Help Meet Student Needs
F–4 Provide Information on Educational and Career Opportunities
F–5 Assist Students in Applying for Employment or Further Education

Category G: School-Community Relations

G–1 Develop a School-Community Relations Plan for Your Vocational Program
G–2 Give Presentations to Promote Your Vocational Program
G–3 Develop Brochures to Promote Your Vocational Program
G–4 Prepare Displays to Promote Your Vocational Program
G–5 Prepare News Releases and Articles Concerning Your Vocational Program
G–6 Arrange for Television and Radio Presentations Concerning Your Vocational Program
G–7 Conduct an Open House
G–8 Work with Members of the Community
G–9 Work with State and Local Educators
G–10 Obtain Feedback about Your Vocational Program

Category H: Student Vocational Organization

H–1 Develop a Personal Philosophy Concerning Student Vocational Organizations
H–2 Establish a Student Vocational Organization
H–3 Prepare Student Vocational Organization Members for Leadership Roles
H–4 Assist Student Vocational Organization Members in Developing and Financing a Yearly Program of Activities
H–5 Supervise Activities of the Student Vocational Organization
H–6 Guide Participation in Student Vocational Organization Contests

Category I: Professional Role and Development

I–1 Keep Up-to-Date Professionally
I–2 Serve Your Teaching Profession
I–3 Develop an Active Personal Philosophy of Education
I–4 Serve the School and Community
I–5 Obtain a Suitable Teaching Position
I–6 Provide Laboratory Experiences for Prospective Teachers
I–7 Plan the Student Teaching Experience
I–8 Supervise Student Teachers

Category J: Coordination of Cooperative Education

J–1 Establish Guidelines for Your Cooperative Vocational Program
J–2 Manage the Attendance, Transfers, and Terminations of Co-Op Students
J–3 Enroll Students in Your Co-Op Program
J–4 Secure Training Stations for Your Co-Op Program
J–5 Place Co-Op Students on the Job
J–6 Develop the Training Ability of On-the-Job Instructors
J–7 Coordinate On-the-Job Instruction
J–8 Evaluate Co-Op Students' On-the-Job Performance
J–9 Prepare for Students' Related Instruction
J–10 Supervise an Employer-Employee Appreciation Event

RELATED PUBLICATIONS

Student Guide to Using Performance-Based Teacher Education Materials
Resource Person Guide to Using Performance-Based Teacher Education Materials
Guide to the Implementation of Performance-Based Teacher Education

The content of modules in Categories B, C and D can be useful to vocational education instructors generally. Content of modules in the other categories is primarily pointed toward teachers or potential teachers of vocational education in senior high schools and post-secondary vocational schools.

Selected excerpts from Module B-4, Develop a Lesson Plan, are shown below to indicate the nature and potential usefulness of the materials. The page entitled "About This Module" uses the format common to all modules. It includes:

1. A terminal objective.
2. Enabling objectives.
3. Resources.
4. Learning experiences.

Learning Experience II is reproduced in its entirety, as is a checklist to measure the quality of the preliminary lesson plan.

ABOUT THIS MODULE

Objectives

Terminal Objective: While working in an actual school situation, develop a lesson plan. Your performance will be assessed by your resource person, using the "Teacher Performance Assessment Form," pp. 31-32 (Learning Experience IV).

Enabling Objectives:

1. After completing the required reading, critique a sample lesson plan (Learning Experience I).
2. Utilizing your present knowledge of how to teach, write a preliminary lesson plan (Learning Experience II).
3. During the remainder of your teacher training experience, complete a minimum number of modules containing those skills necessary to write effective daily lesson plans (Learning Experience III).

Resources

A list of the outside resources which supplement those contained within the module follows. Check with your resource person (1) to determine the availability and the location of these resources, (2) to locate additional references in your occupational specialty, and (3) to get assistance in setting up activities with peers or observations of skilled teachers, if necessary. Your resource person may also be contacted if you have any difficulty with directions, or in assessing your progress at any time.

Learning Experience I

Optional

Sample lesson plans or lesson plan formats in your service area which you can review.

Learning Experience II

Required

A resource person to evaluate your preliminary lesson plan.

Optional

Two peers to work with in developing various types of lesson plans.

Learning Experience III

Required

A resource person to help you determine the additional modules you need to complete to write an effective lesson plan.

A resource person to verify your successful completion of these modules.

Learning Experience IV

Required

An actual school situation in which you can develop a lesson plan.

A resource person to assess your competency in developing a lesson plan.

Learning Experience II

OVERVIEW

Enabling Objective

Utilizing your present knowledge of how to teach, write a preliminary lesson plan.

Activity

You will be selecting objective(s) for a lesson.

Activity

You will be planning a lesson which would enable students to achieve the stated objective(s).

Optional Activity

You may wish to work with peers who are taking this module at the same time as you are and arrange for each of you to do one of the three lesson plan types.

Feedback

Your preliminary lesson plan will be evaluated by your resource person, using the "Checklist for Preliminary Lesson Plan."

Activity

Every lesson plan is built around one or more student performance objectives. At this point, you need to select the objective(s) of the lesson you will be planning. To do this, you may select from any unit plan objectives you may have developed, or you may select another objective(s), with the permission of your resource person. Remember, unit plan objectives are usually more **general** than daily lesson objectives; if you select from unit plan objectives you developed, these objective(s) may need refinement.

Activity

You are now ready to plan, in writing, a lesson that will enable students to achieve the objective(s) you selected. Your lesson plan should include all necessary information. Check with your resource person to see if he or she has a specific lesson plan format for you to follow.

Optional Activity

If you can locate two peers who are completing this module at the same time as you are, you may wish to arrange for each of you to concentrate on developing one of the three types of lesson plans: informational, manipulative skill, and problem-solving. You could then share and discuss your results and have samples of all three types available for future reference.

Feedback

After you have developed your preliminary lesson plan, arrange to have your resource person review and evaluate your plan. Give him/her the "Checklist for Preliminary Lesson Plan," to use in evaluating your work.

CHECKLIST FOR PRELIMINARY LESSON PLAN

Directions: Place an X in the NO, PARTIAL, or FULL box to indicate that each of the following performance components was not accomplished, partially accomplished, or fully accomplished. If, because of special circumstances, a performance component was not applicable, or impossible to execute, place an X in the N/A box.

Name ____________________

Date ____________________

Resource Person ____________________

	LEVEL OF PERFORMANCE			
	N/A	No	Partial	Full
1. There is a stated **objective** in the plan	☐	☐	☐	☐
2. The objective is stated in terms of a single student behavior	☐	☐	☐	☐
3. The objective contains the conditions under which the objective will be achieved, and the criteria via which achievement will be measured	☐	☐	☐	☐
4. There is an **introduction**	☐	☐	☐	☐
5. The introduction contains information or techniques meant to motivate students and orient them to the lesson objective	☐	☐	☐	☐
6. There is a statement in the plan indicating what **methods, techniques,** or **learning experiences** will be used to help students achieve the lesson objective	☐	☐	☐	☐
7. Students are given an opportunity to apply what they learned	☐	☐	☐	☐
8. The necessary **content** for the methods selected (i.e., key questions, information outline, step-by-step procedures) is included in the plan	☐	☐	☐	☐
9. There is a **summary**	☐	☐	☐	☐
10. The summary contains information or techniques meant to pull loose ends together, restate major points, and relate the lesson to the objective	☐	☐	☐	☐
11. A method of **evaluation** is provided	☐	☐	☐	☐
12. **Resources** are included in the plan	☐	☐	☐	☐

LEVEL OF PERFORMANCE: All items must receive FULL, or N/A responses. If any item receives a NO, or PARTIAL response, the teacher and resource person should meet to determine what additional activities the teacher needs to complete in order to reach competency in the weak areas.

The Division of Vocational Education of The Ohio Department of Education has prepared a series of bulletins entitled The Heart of Instruction. The bulletins, each about 50 pages long, listed below are available from Ohio Agricultural Education, Curriculum Materials Service, The Ohio State University, Room 254, 2120 Fyffe Road, Columbus, Ohio 43210. The set of 13 titles cost $16.25; individual titles cost $1.50.

Examinatin of the titles and the content of the bulletins indicates the applicability of the materials to vocational education generally; the usefulness is clearly not limited to agricultural education.

Bulletins Available

Series Number	Title
1	It Starts With the Teacher
2	Psychology of Learning
3	Understanding the Adolescent Learner
4	Selection and Use of Instructional Resources
5	Selection and Use of Teaching Strategies
*6	Effective Lesson Plans and Assignments
7	Teaching Communication Skills
8	Relationship of Math and Science Principles to Vocational Curricula
9	Claseroom Climate for Effective Learning
10	Classroom and Laboratory Management
11	Techniques of School and Classroom Discipline
12	Evaluation of Learning
13	Leadership for Improved Learning

Bulletins 3, 8 and 11 have limited value for instructors of adult vocational education courses. All other titles contain resources which can be useful, as is indicated in the following excerpt from Bulletin No. 6.

EVALUATION OF LESSON PLANNING AND TEACHING OF LESSONS*

A. In planning the lesson:

1. Does the title of the lesson indicate as accurately as possible the exact content of the lesson?
2. Do the objectives state what the outcome of the instruction is to be in terms of student skill and understanding?
3. Are specific references and training aids listed?
4. Does the introduction explain in a general way what is to be covered in the lesson?
5. Does the introduction include information on how the class will be conducted?

---

*Used with permission of Occupational Education Department, University of New Hampshire.

6. Does the introduction explain the relation of the lesson to previous lessons?
7. Does the introduction tell the student how he or she will use the material or skills acquired for the lesson?
8. Is there a timetable showing approximately how much time should be spent on each part of the lesson? Is the amount of time spent on various parts of the lesson consistent with the importance of those parts?
9. Are there sufficient questions for checking student understanding of key points of the lesson?
10. Do questions make students apply nd interpret information?
11. Is the outline of subject matter and the steps of procedure complete and definite enough so that no essential materials can be omitted?
12. Are training aids scheduled at the right time for maximum effectiveness?
13. When a film is used, does the lesson plan provide for an introduction to the film? Does it also provide for follow-up?
14. Does the lesson plan provide for maximum student participation and drill without sacrificing other important phases of the lesson?
15. Is there provision for repetition and emphasis of important points?

B. During the introduction to lesson, did you:

1. Test the group's knowledge with well-planned questions?
2. Tell what information and what degree of skill were to be learned in the lesson?
3. Emphasize the need for knowing the information and skills to be learned?
4. Illustrate (from your own past experience or that of others) how content of lesson will be used on a practical job?
5. Tell the students how the class was to be conducted?
6. Try to develop student interest in the subject by illustrations, personal stories and information on related new developments?

C. In teaching principles, did you:

1. Give sufficient information to properly introduce the principle?
2. Build on students' previous knowledge?
3. Bring out each idea in logical sequence?
4. Clearly explain relationship of one idea to the next where possible?

D. In teaching an operation by demonstration, did you:

1. Do and tell?
2. Then do while a student told?
3. And then did selected students do and tell?
4. And finally did all students do under your supervision?
5. Go over main points more than once for emphasis?
6. Drill on those points that must be known?
7. Ask challenging questions so that students had to think through on basic principles?
8. Illustrate or emphasize key points with training aids?
9. Explain new terms?

10. Use personal experiences or stories where appropriate to emphasize points?
11. See that note-taking was significant, was not just "busy work" and did not interfere with presentation?
12. Show students how to record notes on main points of lesson? (It is often more effective to give students a mimeographed sheet of basic notes to which they can add notes and comments.)

E. When questioning, did you:

1. Where appropriate, first direct a question to the class as a whole--pause--and then call on one student to answer?
2. Provide for individual responses to most questions?
3. Evaluate answers and emphasize correct responses?
4. Ask clear, brief and challenging questions?
5. Contact as many students as possible?
6. Encourage accurate, complete answers?
7. Call on students by name "at random" rather than follow an alphabetical list of seating arrangement?
8. Use questions all through the lesson?
9. Frame questions extemporaneously to clarify dubious points or to follow up when questions are partially answered?
10. Use the question to correct errors as well as to detect them?

F. In providing for application, did you:

1. Ask questions at proper checking or measuring levels?
2. Encourage students to take notes on key points of the lesson?
3. Provide problems to solve and thoroughly check for errors?
4. Introduce problems that made use of facts taught in lesson and which made the students think in order to apply those facts?
5. Stay with the student after the correction was made to make sure that the right way is put into practice?
6. Give students a definite level of skill to work toward?
7. Secure maximum student participation and drill without sacrificing other important phases of the lesson?
8. Let students practice under your supervision and with suggestions, without "taking over" yourself when difficulty was encountered?

G. During the summary to the lesson, did you:

1. Repeat important points of lesson?
2. Question students on what had been seen in films and filmstrips?
3. Write unfamiliar words on chalkboard if there is doubt about spelling or meaning?
4. List important steps of procedure on board or use charts?
5. Make appropriate use of competition between individuals or groups as a means of keeping up student interest during practice or drill?

H. With regard to training aids, did you:

1. Have material arranged for smooth, easy presentation?
2. Evaluate the aid to make sure it was worth the time spent using it?
3. Make sure mechanical devices operate properly?
4. Follow the use of the aid with summary and questions?
5. Use aids to proper advantage all through the lesson?

I. While teaching, did you:

1. Use colorful and yet accurate language?
2. Stay on your feet or in a position to demand attention?
3. Use meaningful gestures?
4. Know your subject so that you were sure of yourself?
5. Stimulate discussion but remain in control at all times?
6. Employ humor when it could add to the lesson?
7. Change the pace of speaking where it would make the lesson more interesting?
8. Keep interested in the subject and in the job of teaching?

J. With regard to human relations, did you:

1. Try to understand the reason for each student's behavior?
2. Avoid sarcasm and ridicule?
3. Refrain from being "one of the boys" (fraternizing)?
4. Give credit for good work?
5. Attempt to judge students on what they are doing rather than on their past records?
6. Try to be a good sport, but maintain sufficient reserve?
7. Avoid unfavorable references to personal beliefs that may be sacred to others?
8. Use informal methods, yet hold the respect of the class?

K. If disciplinary action was necessary, did you:

1. Reprimand with justice and tact after determining the cause of student's behavior?
2. Adjust any disciplinary action on the basis of what will produce the desired results with individuals?
3. Consider student's mental and physical condition at the time of the reprimand?
4. Stay calm and avoid all arguments?
5. Speak with objectivity?
6. Have and use facts?

L. With regard to participation, did all students:

1. Participate in directed discussion?
2. Contribute ideas?
3. Appear interested?
4. Ask questions that indicated thought on the lesson?
5. Answer questions in full and with apparent understanding?

6. Use tools and/or equipment while learning?
7. Voluntarily have their work checked by the instructor?
8. Appear anxious to develop skills?
9. Show appreciation for equipment properly used?

M. Considering voice and appearance, did you:

1. Speak loud enough without shouting?
2. Keep tone of voice friendly?
3. Speak with enthusiasm?
4. Speak clearly and with careful selection of words?
5. Use your voice to give emphasis (such as pausing before and after important points)?
6. Use the correct pronunciation of words?
7. Dress properly for the job?
8. Present a neat appearance?
9. Avoid mannerisms, such as playing with belt buckles--mannerisms that were without force and meaning?
10. Control temper at all times?
11. Face and talk to the class?
12. Show enthusiasm?

N. With regard to management, did you:

1. Do all you could to provide proper temperature and ventilation?
2. Make the best use of available light?
3. Keep training spaces clean and orderly without limiting worthwhile activity?
4. Make sure that all students could see and hear?
5. Move students when this would provide a better learning situation?
6. Help students to be as comfortable as facilities permit?
7. Keep standing students from gradually working forward until some could not see or hear?
8. Manage so that front seats were filled first and all seats filled from front to back?
9. Arrange seats properly before the group reported for instruction?
10. Manage charts, models and other training aids, so that they were available when needed and properly stored when not in use?
11. Tactfully discourage interruptions by other training or office personnel?
12. Provide for equipment to be ready and placed so that it would be used with minimum disturbance?
13. Stay with the students except in case of emergency?
14. Start and dismiss the class on time?
15. By means of motivation, keep students from moving aimlessly about the classroom or shop and from leaving the room unnecessarily during the period?
16. Facilitate and motivate the students to enter the class on time--no late entries from other classes, etc.?
17. Arrive in the room prior to the arrival of the class?

Performance-Based Teacher Education

Vocational education programs have moved significantly in recent years toward much greater emphasis on performance-based teacher education (PBTE) or competency-based teacher education (CBTE). The origin, nature, scope, and implications of such programs are reviewed briefly below. The material is taken from Vocational Teacher Education: A Review of the Research by Richard Adamsky and Calvin Cotrell.

There is much literature to be found on the concept of performance-based teacher education (PBTE). PBTE (or CBTE, competency-based teacher education) is a concept that is not supported by all teacher educators. In any case, the idea has provided stimulus for a significant amount of research in vocational teacher education.

Vocational teacher education became involved in PBTE in the late 1960s when Cotrell directed a project at The Center for Vocational Education (now the National Center for Research in Vocational Education) to identify the competencies needed by vocational teachers. Cotrell and his colleagues helped to define the purpose for vocational teacher education but, more importantly, established the base from which the Center developed a PBTE system for preparing vocational teachers. The fact that the relationship between system functions and components is redefined is of great significance.

The new system is based on 100 modules developed around 384 elements of a master vocational teacher's performance. Each module includes content appropriate to the performance elements and sequenced learning experiences in order to help learners develop the needed skills. The criteria by which performances can be assessed, standards for appropriate performance, and instruments to use when assessing performance also are included.

Supporting materials which instruct the learners in how to use the modules are available. Also reported is a guide for implementing a PBTE program and a state-of-the-art publication. The modules were developed at a cost of over $18,000 each; they and the supporting materials are available through the American Association for Vocational Materials.

The materials were carefully tested at each stage in their development and have been judge effective. Feedback has been obtained from more than 2,000 preservice and inservice teachers as well as 300 resource persons (teacher educators) in over 20 colleges and universities. The materials were judged effective in helping learners develop specific teaching competencies. It has been recommended that they be used to prepare vocational teachers at both the preservice and inservice levels.

Not everyone accepts the PBTE concept. This situation has slowed down its diffusion and adoption. However, based upon a 1978 sales report from AAVIM, the materials are now being widely disseminated. Currently they are finding their way into colleges and universities here and overseas. State departments of education are purchasing them as well as secondary schools.

The PBTE materials have become available at a critical time. Over 30 states have either shown support of the concept or are seriously considering such action. At present there are at least 20 national centers, consortia, institutes, and other groups which have the promotion of the PBTE concept as one of their major purposes.

As stated above, the PBTE materials, if used in the manner suggested, will redefine the role of the teacher educator. The materials themselves take on most of the functions normally assumed by teachers educators. The materials include system content and learning experiences organized to promote learning. The modules provide for learner feedback and self-evaluation. They also suggest how the student should use the materials and how the student's resource person might operate to assist in the learning process. In addition, the materials suggest how the program might be operated and managed. As indicated, materials assume most of the functions normally assigned to the teacher educator. As such, they and the learners who use them become the primary components in a PBTE system.

The Handbook for Teachers of Adult Occupational Education, includes the following checklist to be used for evaluation of a course of study. While it might be used to judge present courses or programs, it might also be used as a guide by program planners or instructors as they design and teach new programs.

EVALUATION OF A COURSE OF STUDY

Directions: Place an X in the appropriate column for each item. Columns 1 through 4 represent a decreasing importance of the item to your situation. The last column indicates that the item does not apply to your situation.

	1	2	3	4	NA
° Are course objectives consistent with:					
. Objectives of the program?					
. Interests and abilities of the student?					
. Needs of employment?					
. Procedures followed by employers?					
. Facilities available?					
. Methodology?					
. Laws and regulations?					
° Do lesson objectives:					
. Clearly state expected changes?					
. Consider student attitudes?					
. Consider student traits?					
. Specify new knowledge?					
. Specify new skills?					
. Show linkages to previous material?					
. Indicate linkages to future material?					

	1	2	3	4	NA
. Provide for reinforcement of learning?					
. Relate to lesson evaluations?					
. Provide for individual differences?					
. Provide for motivation?					
. Consider time factors?					
. Provide for summary and review?					
° Is the course content:					
. Closely related to objectives?					
. Comprehensive?					
. Important?					
. Realistic?					
. Adjusted for in-school or on-the-job experience?					
. Appropriate for facilities available?					
. Adapted to needs of employers?					
. Correlated or integrated with other courses within the total curriculum?					
. Safe?					
. Arranged in natural units?					
. Include references for both instructor and student?					
. Arranged logically?					
. Arranged in order of learning difficulty?					
. Approved by the local advisory committee?					
° Do proposed student activities:					
. Closely relate to course objectives?					
. Motivate learning?					
. Reflect real jobs rather than busy work?					
. Provide practice sessions?					
. Follow standard school practices?					
. Relate to available facilities?					
. Provide for individual differences?					
. Involve intellectual effort?					
. Involve creative effort?					
. Involve planning?					
. Provide for flexibility to meet unforeseen happenings?					
. Meet with standards of local employers?					
. Involve all lessons?					
. Follow a logical sequence?					
. Correlate with other subjects?					

	1	2	3	4	NA
° Does the proposed system of evaluation and measurement:					
. Provide for pretesting to determine where students are or where they should begin?					
. Provide for mastery tests?					
. Provide for charts or other means of recording student progress?					
. Relate to course and lesson objectives, or in other words, measure what it is suppose to measure?					
. Provide for corrective feedback for use in revision and updating?					
° Is the suggested methology:					
. Appropriate for each lesson?					
. Something you can do?					
. Appropriate for teaching aids available?					

SELECTED LESSON PLANS

SELECTED LESSON PLANS

As indicated in foregoing materials, lesson plans are influenced by many factors. Commitment to performance-based program objectives may result in a greatly reduced role for the classroom instructor in lesson planning; the planning of content and method for the lesson has been done for him by experts. A philosophic commitment to the values of humanistic education involves the instructor in a role of resource and expediting specialist which is quite different from that of a PBE instructor.

Despite these basic differences the importance of lesson planning remains. Good teaching-learning situations are much more often the result of careful planning than the result of accidential serendipities. Careful planning implies a Written Plan. The synthesis of objectives, time, teaching materials, and teaching strategies that comprise a well-taught (and well-learned) lesson is too complex to evolve spontaneously; it is much more likely to occur when it has been thought through and recorded by the instructor or curriculum planners.

Lesson plans obviously vary greatly. They are shaped by objectives, instructor expertise, time constraints, type of students, learning resources available, and many other factors. The examples cited below illustrate some of the variety found in ERIC and IRIS literature.

Affective Education Lesson Plan

Vocational education teachers in their concern for developing psychomotor skills, and cognitive knowledge may give little attention to developing attitudes; the affective domain.

Nancy L. Odum and others at the Clemson University, South Carolina Vocational Education Media Center, have prepared an Affective Education Handbook for Vocational Education.

Instructors and/or program developers may find interesting and helpful the following lesson plan taken from the publication cited above.

PERSONAL RESPONSIBILITIES--EFFICIENCY

OBJECTIVE:

The student will be able to demonstrate how one's responsibility to do a job affects the efficiency of the entire company.

MATERIALS NEEDED:

One case study--Jack Jones.

GROUP ACTIVITY:

1. Immediately lead into the task for the session (i.e., "Today our personnel committee has had another situation brought to our attention.")

2. Hand out the case and ask for a volunteer to read it aloud.

3. Allow 15 minutes for the group to discuss and arrive at a decision. The alternatives given may be used in any combination. The group may develop its own course of action.

4. At the end of the allotted time ask for the group's decision (i.e., "Would someone volunteer to give the decision?")

FEEDBACK:

1. Explain how poor attitude (bragging, gossiping, etc.) can be costly to the total operation of a company.

2. Although being a competent worker is a most important factor, there are other factors involved in any work situation; i.e., cooperation, attendance.

3. Jack Jones might have been placed on the wrong type of job. Not everyone is suited for assembly line work.

4. A supervisor is responsible for effecting a harmonious, productive working atmosphere as opposed to letting employees work out their own disagreements.

5. Age should have little importance in employee placement within a company.

6. Discuss the responsibility one worker has to another worker in:

   A. Getting work done

   B. Assisting each other

   C. Making work easier

   D. By working together it is possible to accomplish more than by working alone.

*You should not mention the word "attitude" before group discusses the case.

CASE

JACK JONES

The production supervisor has called in the supervisor of the assembly line. The production supervisor points out that production in the assembly department is down for the second month in a row. The supervisor wants to know what the problem is. The report states:

> "We hired a young fellow, Jones, on the assembly line about three months ago. He works real fast, so fast in fact, that the men have trouble keeping up. A couple of times Jones has griped about the slowness of the other men. The men, however, come to me complaining that Jones is just a showoff who enjoys coming in and upsetting the rest of the crew. When I hired Jones, I thought he might stimulate the men to put out more work, but he does have a tendency to brag. And, it seems like the opposite has happened."

TASK:

Knowing what the problem is, agree or disagree with the following possible solutions.

Promote Jones to assistant because of his efficiency.

Persuade Jones to slow down his work so that he will be better liked and get along with the other men.

Talk individually to the older workers, explaining that they must increase their production.

Call Jones in and discuss with him the importance of cooperation with co-workers.

Ignore the situation and let men on the line handle Jack their own way.

Consider Jones for another position.

Fire Jones for disrupting the line and cutting production.

Commend Jones for his efficiency and increase the production quota for the rest of the men on the line.

Jack Jones should reconsider his attitude and change his attitude toward his fellow workers.

Self-Study Lesson Plan

The Idaho Water Operators Certification Board has prepared materials Idaho Water Systems: Operators-Reading Assignments and Exercises-Class I and II and Class III and IV, designed to prepare water system operators to take certification examinations.

The materials include a 42-page mimeographed course of study entitled Reading Assignments and Exercises for Water System Operators Class I and Class II. The outlined course of study written by A. T. Wallace is a sample of self-study materials that have proven to be quite helpful in vocational education.

Excerpts from the preface indicate the intent of the course:

The purpose of this course is to prepare Idaho Class I and Class II water system operators to take the certification examination. Careful study of the reading material, completion of the exercises contained in this booklet, together with on-the-job training and experience and attendance at an annual short school will practically guarantee that the student will be sufficiently prepared to pass the certification examination. Hopefully, in the process, he will also become a more qualified operator better equipped to help protect the health of our citizens and the valuable water resources of our state.

You are cautioned, however, that to attain anything worthwhile usually involves some sacrifice and hard work. So it is with advancing in one's chosen occupation. This course has been designed to help you learn, not to teach you. You must teach yourself, primarily through diligent and patient study of the material assigned as part of this course.

The certification examination will cover material from this correspondence course and from the short school lectures. Both sources, however, will present far more material than you could reasonably expect to be examined on in a three-hour written examination. This is in keeping with the general philosophy of the Idaho Water and Sewage Works Operators Certification Boards to expect certified operators to acquire more technical know-how than just the bare minimum needed to attain a certain grade on a test. It is also felt that any technical training, if it is to be meaningful, must broaden the trainee's capacities as well as providing depth to purely job-related skills and knowledge. Therefore, in preparing this course, a concerted effort was made to avoid getting over-academic and at the same time the opposite extreme was avoided, that of presenting material which was so occupation-oriented as to produce automata. The compromise which was sought was to help the trainee acquire knowledge and technical skills sufficient to operate his plant better now and also to inspire him to continue learning and improving his operation, even after he becomes certified.

One fact cannot be overemphasized. This course is designed to help you, not to evaluate your present ability or to "check up" on you. Your score on the certification exam will determine whether or not you receive a certificate, not your performance on this correspondence work. However, as has already been stated, if you work conscientiously through the material of this course you may be assured that the certification examination will hold no surprises for you.

General instructions for the course are stated as follows:

The texts for this course are the Manual of Instruction for Water Treatment Plant Operators, 2nd Edition, published by the New York State Department of Health and Elementary Mathematics and Basic Calculations.

In the assignments, all page numbers are inclusive. Read the assignments carefully searching for the significant points of each paragraph. Underline or take notes on the very important points trying to anticipate the questions which will be asked. In this way you focus your attention on the "meat" of the material and make more efficient use of the time you set aside for studying.

Try reading the assignment and waiting a day before you work the exercise. This will train your powers to "recall" important information and is a better test of your reading comprehension than working the exercises immediately after reading the material.

Generally you will be asked to read some material and then work a short exercise. You will usually be asked to complete statements with the correct word or phrase. In checking your answers against those given, look for the sense of the answer rather than the exact word or words given. If your answer means the same or nearly the same as the answer given, then count it as correct. Occasionally you will be asked to define a term, explain a concept, make a sketch or something of this nature. Whatever the form of the exercise, the intent is to point out to you the important points from the reading material. You will benefit from reading an assignment over again whenever you have made a poor showing on the exercise following it.

Various sections in the course of study introduce the student to basic knowledge needed for certification in the areas of:

Mathematics
Chemistry
Biology and Bacteriology
Hydraulics and Electricity
Water Treatment and Plant Operation

The study outline for the section on Biology and Bacteriology reproduced below illustrates the learning approach used in the Idaho-produced materials:

BIOLOGY AND BACTERIOLOGY

In this section you will begin your study of living organisms and their life processes. You will not be expected to become expert biologists or to learn a lot of scientific names or anything of that sort. Instead you will learn some basic definitions and try to become familiar with some factors affecting biological growth. The portion of biology you will be primarily occupied with concerns the lower biological forms; the bacteria, algae, protozoa, fungi and such. These minute organisms are widespread in nature and are intimately involved in many of the processes of water and waste treatment.

Read carefully the appendix on Biology-Bacteriology in your New York manual. Then try to answer the questions in the first exercise. If you miss more than four of the answers, you have missed too many important points in your reading. Go back and read the material over again, more slowly this time. Then try the second exercise. You should do better this time, missing no more than three of the answers. If you have done this well or better you have managed to assimilate the most important points of the reading assignment.

Exercise 1

(1) Bacteria are living organisms which consist of (one, two, several, numerous) cell(s).

(2) Bacteria reproduce by a process known as ____________________.

(3) The most common shapes of bacterial cells are ____________________, ____________________, and ____________________.

(4) The saprophytic bacteria obtain their food from ____________________ organic matter.

(5) Parasitic bacteria inhabit the body of another organism, called a ____________________, from which they derive their food.

(6) Parasitic bacteria which produce end products which harm the organism they inhabit are called ____________________ bacteria.

(7) Aerobic organisms must have ____________________ oxygen for their respiratory processes.

(8) Organisms which can utilize chemically-bound oxygen are known as ____________________.

(9) ____________________ are resting stages which some bacteria develop into in order to survive unfavorable environmental conditions.

(10) When microscopic organisms are controlled through the use of chemicals, the action depends on both ____________________ and ____________________.

(11) The group of bacteria which are usually used to indicate fecal contamination in water is known as the ____________________.

(12) An association of bacteria and higher forms of life found suspended in natural waters are known as ____________________.

(13) One-celled plants containing chlorophyl are the ____________________.

(14) With ____________________ as an energy source, the algae absorb ____________________ ____________________ ____________________ (a gas) and produce ____________________ ____________________ (a gas).

(15) One-celled animals commonly found in sewage and water are the ____________________.

(16) Three important water-borne diseases are ____________________, ____________________, and ____________________.

(17) A water supply, to be considered 100% safe from a bacterial standpoint, must have had the ____________________ bacteria completely eliminated.

(18) In a bacteriological examination of water, the bacteria actually producing diseases are not tested for. However, if the ______________ group of bacteria which are tested for are found, or are found in very small numbers, then the assumption is made that the disease-producers, or __________________ __________ ______________ are absent.

Answers--Set 1

(1) one
(2) fission (splitting)
(3) rods, spheres, spirals
(4) dead
(5) host
(6) pathogenic
(7) molecular (atmospheric, free)
(8) anaerobic
(9) spores
(10) concentration, time
(11) coliform group
(12) plankton
(13) algae
(14) sunlight, carbon dioxide, oxygen
(15) protozoa
(16) typhoid fever, cholera, dysentery
(17) pathogenic
(18) coliform, pathogens

Exercise 2

Match the statement, phrase or word in the left column with the item from the right column which is most appropriate.

(1) A water-borne disease
(2) Reproductive process of bacteria
(3) One-celled, chlorophyll-bearing plants
(4) Requiring molecular oxygen
(5) Resting stage of some bacteria
(6) Group of intestinal bacteria used as indicators of pollution
(7) One-celled animals
(8) Capable of using chemically-bound oxygen
(9) Disease-producing
(10) Use dead organic matter as food

(a) saprophytic
(b) aerobic
(c) pathogenic
(d) spores
(e) algae
(f) protozoa
(g) typhoid
(h) fission
(i) coliforms
(j) anaerobic

(11) The process by which algae obtain energy and manufacture food is called ________________________________.

(12) The effectiveness of chemical control of microscopic organisms depends on both ____________________ and ____________________________.

Answers--Set 2

(1) g (2) h (3) e (4) b (5) d (6) i
(7) f (8) j (9) c (10) a
(11) photosynthesis (12) concentration, time

Management of Instruction Lesson Plan

A staff guide, Advanced Instructional Technology, prepared by the Municipal Operations and Training Division of the National Training and Operational Technology Center, includes a unit on management of instruction. The following material, provided by Audrey Kroner of the NTOTC staff, includes: (1) the unit overview, (2) the lesson on classroom management, and (3) the lesson on planning and conducting workshops.

ADVANCED INSTRUCTIONAL TECHNOLOGY

UNIT TEN
MANAGEMENT OF INSTRUCTION - Unit Overview

Estimated time for unit - 2 hours 10 minutes

Overview

This unit consists of three lessons each dealing with the management of particular kinds of instructional situations: formal, classroom instruction, on-the-job or near-site training, and workshops. Each lesson deals with materials particularly important to the conduct of that kind of instructional activity, but they also contain suggestions and considerations relevant across all three situations. The main focus of the lesson on classroom management is the control of the physical and psychological environment of the instructional situation. The lesson on training in a work environment highlights techniques, advantages and disadvantages of on- or near-site training. Finally, the lesson on planning workshops details the kinds of specific logistical preparations that may have to be completed in advance of an instructional activity.

Entering Competencies

No specific entering competencies are required.

Summary of Objectives

As a result of this unit's instruction participants will be able to:
- identify important variables in the physical and interpersonal environment of the classroom and describe examples of techniques for classroom management and maintaining trainee attention
- describe techniques and characteristics of effective training in the work environment
- describe administrative and logistical considerations involved in planning and conducting a workshop.

Evaluation Activities

The instructor will insure that participants have accomplished the unit's objective through their participation in class discussions.

References David, L. M. and McCallon, E. Workshops. Austin, Texas: Learning Concepts, 1974.

Summary of Unit Activities

Lesson Title	Instructional Methods	Time	Support Materials
1) Classroom Management	Lecture; Guided Discussion	45 min.	Content Outline Figure 10.1-10.5 Handout 10.1
2) Training in the Work Environment	Lecture; Guided Discussion	40 min.	Content Outline
3) Planning and Conducting Workshops	Guided Discussion	45 min.	Workshop Check List

UNIT TEN: MANAGEMENT OF INSTRUCTION
LESSON 1 of 3: CLASSROOM MANAGEMENT

Estimated time: 45 minutes

Entering Competencies

None.

Objectives

Behavior / *Conditions* / *Acceptable Performance*

The activities of this lesson will enable participants to identify important variables in the physical and interpersonal environment of the classroom and predict their impact upon instructional effectiveness. In a guided discussion, participants will draw upon their personal experiences to demonstrate their understanding of the variables by identifying and describing the impact of at least one variable.

Behavior / *Conditions* / *Acceptable Performance*

Participants will also be able to describe and give examples of basic techniques for managing the class and maintaining attention. In general discussion, each participant will describe and provide an example of at least one technique.

Justification

A variety of physical and psychological variables can have a serious impact upon the effectiveness of instructional presentations. This lesson reviews those variables which can be controlled through careful management of instructional activities in the classroom.

Evaluation Activities

Instructor will insure that participants have accomplished the unit's objectives through their participation in class.

Resources

Content Outline

Figure 10.1 Environmental Influence
10.2 Physical Environment
10.3 Psychological Environment
10.4 Planning Considerations
10.5 Managing Techniques

Handout 10.1 Techniques for Overcoming Problems with the Physical or Psychological Environment

Instructional Approach

This lesson begins with a brief introductory lecture on the impact the environment can have on instruction. This is followed by a guided discussion of the physical and psychological factors which may impede learning. Finally, a discussion and summary lecture on techniques for controlling these factors and minimizing their effects should be planned. A handout has been designed to accompany this lesson, but it should not be given out until the end to insure meaningful and creative discussion sessions.

1. Introduce the topic of environmental influences on learning and instruction.

2. Conduct a discussion on the physical and psychological environment of the classroom. Have each participant suggest a specific characteristic and describe its potential impact upon instructional effectiveness. (See content outline.) List the points as they are generated.

3. In a similar manner, ask participants to suggest techniques for managing the class and maintaining attention that will control environmental factors or limit their effects. Call upon individual participants to suggest techniques and give examples. Give a brief lecture summarizing the techniques for overcoming problems with the environment (listed in the content outline).

4. At the conclusion of the lesson, distribute Handout 10.1 for inclusion in Participant Reference Manual.

UNIT TEN: MANAGEMENT OF INSTRUCTION
LESSON 1 of 3: CLASSROOM MANAGEMENT

Content Outline

Estimated

I. Introduction (lecture, 5 minutes)

A. Environment's influence on instruction is illustrated by a simple model of the process of instructional communication. The environment may either change the instructional message before it reaches the learner, or affect the learner's ability to receive it — Figure 10.1

B. Two major kinds of environmental influences on instructional communication:

1. Physical environment - the setting for the instruction

2. Psychological environment - the learner's attitudes and dispositions towards the instruction or the setting

C. Summary of this lesson's objectives

II. Environmental Effects on Communication (guided discussion, 20 minutes)

A. Effects of physical environment on communication

Figure 10.2 — *Lead class in guided discussion in which you call upon participants to first identify an important physical characteristic of instructional effectiveness. Some of the characteristics that should be introduced include: classroom size, classroom furnishings, classroom arrangement, lighting, acoustics, class size, time of day, length of class. If the discussion is slow in starting give the first example: (i.e., describe how poor acoustics can effect communication by either making it impossible to hear the message, or by making it so difficult that the trainee gets tired and stops paying attention.) Use Figure 10.2 to summarize the discussion by listing the identified environmental characteristics and their effects.*

B. Effects of the psychological environment on communication

Figure 10.3 — *Continue the preceding discussion, calling upon the participants to describe how the psychological environment can effect instructional communication. Some of the points that should be considered include: teacher attitudes towards the class or the subject of instruction, trainee*

attitudes towards the teacher, and the subject of instruction, motivation and rewards for training, and the interpersonal relationships of the trainees with each other and the instructor. Summarize the discussion using Figure 10.3 on the overhead projector (or use the blackboard).

III. Techniques for Overcoming Problems with the Physical or Psychological Environment (guided discussion and lecture, 20 minutes)

Have participants suggest planning considerations and techniques for managing instruction. In your summary lecture cover any of the points below which may not come up in the discussion.

Figure 10.4

A. Things to consider in planning instruction:

1. Selection of instructional methods and media to accomodate the physical environment
2. Development of rewards for motivating students
3. Planning the teaching schedule to allow for breaks, questioning periods, etc.
4. Determining the degree of formality - informality you wish to maintain in the classroom

B. Techniques for managing the class and maintaining attention:

Figure 10.5

1. Introduce the class by explaining what is to be taught and outlining the instruction. Explain how it meets the needs/interests/backgrounds of the learners
2. Keep learners informed of progress through the instruction (i.e., "the second point that must be explained..., the last exercise for today...")
3. Keep attention focused on key instructional points through verbal directions or emphasis (i.e., "what's important here is that..."). Use media or graphic techniques to highlight points
4. Maintain high levels of learner participation in the instruction
    a) frequent questions and exercises
    b) use of instructional methods other than the lecture

5. Pace the instruction appropriately for that particular group of learners. Use a variety of instructional media and methods

6. During lectures, move closer to the class and/or move around the room if attention is slipping. Stand closest to, or lecture at, those who appear to be falling asleep

7. Counsel "problem" or disruptive learners outside of class

8. Be fair and considerate to all members of the class

Handout 10.1	*Distribute Handout 10.1 for inclusion in Participant Reference Manual.*

UNIT TEN: MANAGEMENT OF INSTRUCTION
LESSON 1 of 3: CLASSROOM MANAGEMENT

Handout 10.1: Techniques for Overcoming Problems with the Physical or Psychological Environment

A. Things to consider in planning instruction:

1. Selection of instructional methods and media to accommodate the physical environment.

2. Development of rewards for motivating students.

3. Planning the teaching schedule to allow for breaks, questioning periods, etc.

4. Determining the degree of formality - informality you wish to maintain in the classroom.

B. Techniques for managing the class and maintaining attention.

1. Introduce the class by explaining what is to be taught and outlining the instruction. Explain how it meets the needs/interests/backgrounds of the learners.

2. Keep learners informed of progress through the instruction (i.e., "the second point that must be explained..., the last exercise for today...").

3. Keep attention focused on key instructional points through verbal directions or emphasis (i.e., "what's important here is that..."). Use media or graphic techniques to highlight points.

4. Maintain high levels of learner participation in the instruction.

   a) frequent questions and exercises
   b) use of instructional methods other than the lecture

5. Pace the instruction appropriately for that particular group of learners. Use a variety of instructional media and methods.

6. During lectures, move closer to the class and/or move around the room if attention is slipping. Stand closest to, or lecture at, those who appear to be falling asleep.

7. Counsel "problem" or disruptive learners outside of class.

8. Be fair and considerate to all members of the class.

UNIT TEN: MANAGEMENT OF INSTRUCTION
LESSON 3 of 3: PLANNING AND CONDUCTING WORKSHOPS

Estimated time: 45 minutes

Entering Competencies

No specific entering competencies are required.

Objective

By the end of this unit, participants will be
Behavior able to describe the various administrative and
logistical considerations involved in planning
Conditions and conducting a workshop. Using the Workshop
Check List (in the Participant Reference Manual)
Acceptable Performance participants will be able to describe the nature
and treatment of each point on the check list.

Justification

Totally aside from questions of instructional design, the planning and conduct of training workshops is a complex endeavor. This unit reviews the variety of tasks and issues that may have to be considered in bringing a workshop to a successful conclusion.

Evaluation Activities

The instructor will insure that participants have accomplished the unit's objective through their participation in class discussions.

Resources

Workshop Check List in the Participant Reference Manual.

Instructional Approach

The presentation of this lesson depends a lot on your own experience (and perhaps that of the participants) in preparing and delivering workshops. Anecdotes and illustrations should be used as much as possible. An effort should be made to tailor your suggestions to the particular training environment facing your participants. This is also a good opportunity for them to raise any particular questions or concerns about their future responsibilities as trainers.

The Workshop Check List in the Participant Reference Manual (a copy is also included here) provides the framework for the instructional activities of this lesson. Go through the Check List on a point-by-point basis. Encourage participant questions and examples.

Particular attention should be given to the following points on the check list: budgeting, timelines for workshop preparation, agendas, field tests, and meeting room arrangements.

1. Under budgeting, discuss some typical budget items and costs for workshops in the participants' settings.

2. In discussing timelines for workshop preparation, emphasize the need to be realistic and allow plenty of time to accomplish everything. (The "Milestones" suggested for this workshop provides an example of the timing of some of these activities.)

3. Note that in planning workshop agendas it is important to be realistic regarding coffee breaks, lunch and the lengths of individual presentations. Participants need to have a break or a change in instructional activities about every hour to hour-and-a-half in order to remain attentive.

4. Stress the importance of field testing every kind of instructional presentation (from a 15-minute address to a week-long workshop). The nature and rigor of the field test can vary substantially. The point is to try out the materials to find out if they really work with an audience similar to your target audience. (No matter how carefully developed the materials are, you are likely to find that they will require substantial revisions. These revisions often mark the difference between successful and unsuccessful workshops.)

5. Under meeting room arrangements discuss how seating and table configurations reflect the nature of desired participant-participant and participant-instructor interactions. (Traditional classroom seating arrangements lead to a traditional classroom atmosphere.)

WORKSHOP CHECK LIST

The following checklist is designed to facilitate the control of key administrative and logistical considerations in planning and conducting workshops.

All of the points will not be relevant to every workshop. Use the left-hand column to check those points which do apply to the workshop under consideration. Establish a deadline for the completion of each point/task and write the date in the space provided. Finally, use the righthand column to check off each task as it is completed.

(Note: This checklist does not consider the design of the workshop's instructional content as these activities are presumed to proceed separately following the steps of the instructional design model presented in Unit One.)

☐ Applicable Completed ☐

Administrative Considerations

☐ Workshop staff identified (Director/Chair, Trainer, Audio-Visual Specialist, Other) *Deadline* ________________ ☐

☐ Budget established (Salaries/honorariums, consultants, media production, equipment and facilities rental, transportation, participant costs, duplication and telephone) *Deadline* ________________ ☐

☐ Production resources identified and availability determined (for signs, manuals, programs, etc) *Deadline* ________________ ☐

Technical Planning and Operations

☐ Target audience identified *Deadline* ________________ ☐

☐ Workshop date or dates determined *Deadline* ________________ ☐

☐ Overall timelines for workshop preparation established *Deadline* ________________ ☐

☐ Means of contacting target audience determined *Deadline* ________________ ☐

☐ Target audience contacted *Deadline* ________________ ☐

☐ Workshop's objectives defined *Deadline* ________________ ☐

☐ Agenda established *Deadline* ________________ ☐

☐ First draft of training materials/presentations *Deadline* ________________ ☐

☐ Field test of workshop materials *Deadline* ________________ ☐

☐ Meeting rooms and other facilities located and reserved (see below) **Deadline** ____________ ☐

☐ Revised workshop materials **Deadline** ____________ ☐

☐ Materials reproduced in final form for workshop **Deadline** ____________ ☐

☐ Travel arrangements completed **Deadline** ____________ ☐

Facilities Arrangements

☐ Meeting room arranged as desired **Deadline** ____________ ☐

☐ Provision for room darkening available **Deadline** ____________ ☐

☐ Room clean, furniture suitable, lighting/air conditioning working properly **Deadline** ____________ ☐

☐ Public address system available and working **Deadline** ____________ ☐

☐ Water glasses/pitchers available for speakers and participants **Deadline** ____________ ☐

☐ Ashtrays available and/or local smoking regulations determined **Deadline** ____________ ☐

☐ Chalkboard, easels, screens, pointers available for presentations as required **Deadline** ____________ ☐

☐ Pencils, note paper available for participants **Deadline** ____________ ☐

☐ Arrangements made for coffee breaks/lunch **Deadline** ____________ ☐

☐ Arrangements for participant registration complete **Deadline** ____________ ☐

Audio-Visual Preparations

☐ Necessary projection equipment of suitable size and type available/ordered **Deadline** ____________ ☐

☐ Projectionist scheduled for each session **Deadline** ____________ ☐

☐ Availability/compatibility of power source determined **Deadline** ____________ ☐

☐ Spare lamps and fuses obtained **Deadline** ____________ ☐

☐ Public address system tested and volume levels set **Deadline** ____________ ☐

☐ Projection equipment tested in the meeting room using actual materials **Deadline** ____________ ☐

☐ Recording equipment set up and tested **Deadline** ____________ ☐

☐ Copies of all print and audio-visual materials delivered to workshop site **Deadline** ____________ ☐

Instructional Methods Lesson Plan

The governments of ten Caribbean countries developed, as part of the Caribbean Basin Water Management Project, an Instructor's Manual and Planning Guide for Training of Trainers. This 435-page publication suggests detailed content and teaching strategies for a series of three 20-hour workshops designed to improve the competence of trainers involved in training (upgrading) personnel who work in water supply systems. The Table of Contents of this useful resource is as follows.

CARIBBEAN BASIN WATER MANAGEMENT PROJECT

INSTRUCTOR'S MANUAL & PLANNING GUIDE FOR *"TRAINING OF TRAINERS"*

TABLE OF CONTENTS

SECTION	TITLE	PAGE
1	PREFACE	1
2	CONTACTS FOR MORE INFORMATION	2
3	BACKGROUND	3
4	THE CARIBBEAN BASIN WATER MANAGEMENT PROJECT (1978)	7
	4.1 Development of the TDS Organization	7
	4.2 Training of Trainers	11
	4.3 Development of Training/Job Manuals	13
	4.4 Manager/Supervisor Workshops & Premier Briefings	15
5	TRAINING OF TRAINERS WORKSHOPS	17
	5.1 Objectives	17
	5.2 Suggested Selection Criteria	17
	5.3 Description of Unit Format	17
	5.4 Coding System Used	26
WORKSHOP 1	OUTLINE	27
	TIMETABLE	28
	UNIT 1: TASK ANALYSIS (TA)	29
	● Lesson 1: Task Analysis Concepts	31
	● Lesson 2: Definition & Identification of Tasks	64
	● Lesson 3: Definition & Identification of Operations	80
	● Lesson 4: Job Structure Flow Chart	84

TABLE OF CONTENTS *(Cont'd)*

SECTION		TITLE	PAGE
WORKSHOP 1 (Cont'd)	● Lesson 5:	Analysing the Task	95
	● Lesson 6:	Operation Breakdown	106
	UNIT 2:	PERFORMANCE OBJECTIVES (PO)	115
	● Lesson 1:	Definition of and Reasons for Performance Objectives	117
	● Lesson 2:	Performance Objective Components	136
	● Lesson 3:	Writing & Evaluating Performance Objectives	155
	UNIT 3:	PRESENTATION TECHNIQUES	166
	● Lesson 1:	Principles of Learning	168
	● Lesson 2:	Factors Affecting Learning	181
	● Lesson 3:	Instructional Methods	191
	● Lesson 4:	The Instructional Plan	211
	CRITIQUE FORM - WORKSHOP 1		224
	HOME STUDY ASSIGNMENT		227
WORKSHOP 2	OUTLINE		229
	TIMETABLE		230
	UNIT 4:	REVIEW OF TA & PO	231
	● Lesson 1:	Review of Task Analysis	233
	● Lesson 2:	Review of Performance Objectives	238
	UNIT 5:	PRESENTATION SKILLS	240
	● Lesson 1:	Communication	242
	● Lesson 2:	Feedback	253

TABLE OF CONTENTS *(Cont'd)*

SECTION | TITLE | PAGE

WORKSHOP 2 (Cont'd)

UNIT 6: INSTRUCTIONAL MEDIA 257

● Lesson 1: Introduction to Instructional Media 259

● Lesson 2: Graphics 277

UNIT 7: QUESTIONING TECHNIQUES 292

● Lesson 1: Oral Questioning Techniques 294

UNIT 8: PRESENTATION PREPARATIONS 306

● Lesson 1: Selecting Site & Trainees for Presentation 308

● Lesson 2: Training Prerequisites 318

● Lesson 3: Organizing the Presentation 325

● Lesson 4: Critique of Presentations 331

UNIT 9: PERFORMANCE EVALUATION 337

● Lesson 1: Introduction to Performance Evaluation 338

● Lesson 2: Preparing Evaluation Devices 351

CRITIQUE FORM - WORKSHOP 2 367

HOME STUDY ASSIGNMENT 369

WORKSHOP 3

OUTLINE 371

TIMETABLE 372

UNIT 10: REVIEW OF PREPARATIONS FOR PRESENTATION 373

● Lesson 1: Review of Task Analysis 375

● Lesson 2: Review of Preparations of Instructional Plan 377

TABLE OF CONTENTS *(Cont'd)*

SECTION	TITLE		PAGE
WORKSHOP 3 (Cont'd)	UNIT 11:	TRAINING PROBLEMS	386
	● Lesson 1:	Training Facilities	388
	● Lesson 2:	Training Participants	395
	● Lesson 3:	Government, Management & Labour Cooperation	406
	UNIT 12:	TRAINING DELIVERY SYSTEM (TDS)	413
	● Lesson 1:	The TDS Concept	415
	● Lesson 2:	EC Water Utility TDS	421
	CERTIFICATE AWARD CRITERIA		431
	SAMPLE CERTIFICATE		433
	AIDE MEMOIRE		434

The detailed nature of the lesson plans found in this manual is shown in the following lesson, a part of unit three, to be offered in the first of three workshops.

WORKSHOP 1 Training of Trainers

UNIT 3 Presentation Techniques

LESSON 3 ⇨ *INSTRUCTIONAL METHODS*

ESTIMATED TIME 60 minutes

PREREQUISITES Lesson 1 of this Unit

INSTRUCTIONAL/PERFORMANCE OBJECTIVES

- The trainee will be able to:

  differentiate between thelecture method and the demonstration method; and

  select the appropriate method for given situations.

- Under the following conditions:

  given a description of each and information about their advantages and disadvantages.

- To these standards:

  80% correct.

INSTRUCTIONAL RESOURCES

Information Sheets PT.IS.05 and PT.IS.06

Overhead Transparencies PT.OH.10 - PT.OH.18

Resource Material

INSTRUCTIONAL ACTIVITY

INSTRUCTOR ACTIVITY

1. Define instructional method - clarify trainee definitions.

2. Introduce two methods to be discussed - PT.OH.10.
3. Introduce and discuss demonstration method - use PT.IS.05, PT.OH.11 and PT.OH.12.
4. Introduce and discuss lecture method - use PT.IS.06 and PT.OH.13 - PT.OH.18.
5. Introduce and discuss each of the four types of lectures and use each of the overheads.

TRAINEE ACTIVITY

1. Trainee, after definitions for instructional method response to be critiqued by fellow trainee.
2. Trainee to explain why demonstration is applicable to skill and lecture to information.
3. Trainee to review PT.IS.05 then discuss the advantages and disadvantages of this method. As PT.OH.12 is displayed each trainee will be required to discuss the seven items listed.
4. Trainee to review PT.IS.06 then discuss the advantages and disadvantages of this method.
5. Trainee to discuss and differentiate between the four types of lectures.

EVALUATION ACTIVITY

1. Trainee given a variety of presentations for which he must select the appropriate method to use.
2. Trainee to list the advantages of lecture method and those of demonstration.

DEMONSTRATION METHOD OF TRAINING

The purpose of a demonstration is to explain and show the precise or preferred actions necessary to perform skills or processes.

ADVANTAGES

1. Learning is in a practical situation.
2. Method of training appeals to more than one sense.
3. Trainees observe the "Standard of Practice" at first hand.

DISADVANTAGES

1. Requires careful attention to logistics.
2. Number of trainees limited.
3. Demonstrating may place above normal demands on the instructor.
4. Difficult to obtain accurate feedback if this method of training alone is used.

PREPARATION

Have all of the materials and tools required to carry out the demonstration laid out in an orderly manner before you begin, making sure they are in working order. There is nothing more harmful to the smooth running of a demonstration than for the demonstrator to have to break off and fetch a tool or piece of material from another part of the room. Such interruptions break up the concentrated attention of the group. While the demonstrator is away, talking breaks out among the group and time has to be spent in bringing the group back into an attentive frame of mind.

PRESENTATION

Use the same tools and equipment for the demonstration that you will expect the participants to use in their work. This helps to inspire confidence. The results achieved by your manipulative skill should obviously be as near perfect as possible, and it is unlikely that any of your group will achieve the same standard at that time. Therefore, if you use your own special tools it leaves in the group's minds a lurking suspicion that they could do better if they were able to use your special tools. This also applies to materials. Try not to select for yourself a special piece of material, but work on an average sample. The group will then realize that any lack of perfection seen in the results of their own work will be due to their inexperience and lack of skill rather than to poor quality tools, equipment or material.

Consolidate each stage of the demonstration by allowing the group to see and handle the results and by recapitulation through questioning. There are definite stages to be passed in any process and these should be clearly registered in the minds of the group. Allow a participant to perform while you and other participants watch. This will offer means of recapitulating and from the reaction of the others, you should be able to discover if they have forgotten any points you have stressed. (See Controlled Practice).

Thoroughly analyse your own actions when carrying out a skilled operation. The skill of a person comes only through constant practice, and when achieved, develops into automatic or almost automatic actions for which little conscious thought is required. The skilled person spends his time thinking about what he is doing rather than how he is doing it. Operations which present no problems to him will, in all probability, create intense difficulty to the beginner. It therefore follows that before he can demonstrate the use of a tool or piece of equipment, he must consider the position in which he places parts of the body in relation to the material and the correct handling of the tool. Always mention any necessary safety precautions.

Make good use of the chalkboard to illustrate points which cannot be readily appreciated. A practical demonstration can show more effective results if the demonstrator acquires a degree of skill with chalk, enabling him to make quick, clear sketches to illustrate points which would not otherwise be obvious.

A skilled person need not be a skilled demonstrator. It is quite easy to fumble through a demonstration in a most clumsy and unskilled manner, mainly due to nervousness in working before an audience. In the first place your main concern must lie in the direction of the group, and your chief thoughts must be concentrated on explaining to the group what you are doing while another part of your mind must be concentrated on the actual operation in hand. It takes time to develop this kind of split-personality mind, but it is a necessary part of the equipment of a demonstrator. It would be wrong to give the group the impression that you are a magician by the wonderful and mysterious way in which you carry out an operation, because they have to follow up your demonstration by carrying out the same operation themselves. Be careful to avoid instilling in them the fear that the operation is too difficult for them.

PERFORMANCE (One of three types)

1. CONTROLLED PRACTICE
    - a) Trainer explains one step.
    - b) Trainer demonstrates that step.
    - c) Trainee performs.
2. INDEPENDENT PRACTICE
    - a) Trainees perform at their own pace.
    - b) They must be observed closely for correction of errors.
    - c) An effective technique is to use first the controlled, then the independent practice.
3. COACH AND PUPIL
    - a) Trainees pair up; one performs, the other observes and corrects.
    - b) The pairing of strong and weak is advantageous to both.
    - c) Close trainer supervision is still required.
    - d) A critique of trainee performance is conducted.

It is easy to set a beginner's effort against your own by exhibiting the difference in quality. This only gives a sense of inferiority. You have reached this standard after years of experience and practice and should be sympathetic towards his first attempt by hinting that you were no better at one time.

The foregoing relates to the demonstration of a skill. The same is true when demonstrating the performance of a piece of equipment.

In the case of equipment, actual objects or scaled models would replace tools and materials.

LECTURE METHOD OF TRAINING

Thepurpose of a lecture should be the drawing together of everything affecting the trainee in a learning situation. Among the several aspects conducive to good learning is the comfort of the trainees. Therefore, before beginning, it is important that each participant can see both the lecturer and the chalkboard without strain or effort.

Four types of learning methods can be considered:

1. Illustrated lecture
2. Briefing
3. Formal speech
4. Teaching lecture

Whichever method is employed, a technique must be developed.

ADVANTAGES

1. It is appropriate for relatively large numbers.
2. Enables presentation of much information in a short time.
3. Does not require elaborate or "real world" equipment.
4. Is conducive to combination with other methods.

DISADVANTAGES

1. Students retain only a small portion of material presented. (It is estimated that the average person retains 10% of what he hears; 50% of what he sees; 80% of what he does).
2. Effectiveness is largely dependent on the capabilities of a single individual.

3. There is generally passive participation by students.

LECTURE TECHNIQUES

1. DEFINE OBJECTIVES

Prepare your lesson carefully. Be quite clear of the amount of information you wish to impart during the presentation, and arrange your facts in logical sequence. A presentation which comprises a rambling statement of disconnected facts is of little value and tends to leave the participants in a state of mental confusion.

2. INVOLVE STUDENTS

Talk with the participants and not at them. It is quite easy for a presentation to have a one-sided approach where the trainer does all of the talking while the participants remain silent listeners, but best results are not achieved that way. It is more effective to develop your subject through convincing questioning of the participants and by allowing them to discuss the subject with you. In this way, they will be stimulated to think for themselves and so take a more vital and personal interest in the presentation. It follows from this that it is important to keep the whole group within the discussion in order that each participant may feel that he or she is making a contribution. To do this one must acquire a special skill which allows one to concentrate on the reaction of each individual participant without losing one's grip on the subject of the presentation. It is easy for an inexperienced trainer to concentrate his whole attention on the few immediately before his eyes and fail to be sensitive to the needs of the remainder of the group.

3. USE APPROPRIATE INSTRUCTIONAL AIDS

Always have illustrative material, where possible, to aid your presentation. Much time and verbosity can be saved if one can show the participants the object being talked about.

4. STRESS MAIN POINTS

Avoid being celver and talking above the heads of the group. In general, the best method is to get the points over in a simple and concise manner. Participants are not usually impressed by a profound and intellectual discourse; they are merely left in a state of mental confusion. Talk in terms that the group will understand, and if you have to use uncommon words or new technical terms, be sure that you can explain them fully. Never leave the group guessing as to your meaning. You can be sure that you have achieved this aim only by developing such friendly relationship that the participants are not afraid to stop you and ask you what you mean or are free enough to ask you to go over a point they did not understand. Always remember that terms and phrases which have become part of your normal vocabulary are, in all probability, quite incomprehensible to the group. Consolidate the main points of your presentation. Always repeat them briefly at the end. This will help to stress the points covered in the early part of the presentation and will impress upon the minds of the participants the logical sequence of facts which have been developed.

5. PROJECT VITALITY

Much of the success of the presentation will depend on your own attitude and manner when delivering it. Avoid any suggestions of lecturing at them and try to be lively and vigorous, and at least give the participants the impression that you are vitally interested in your subjects. It is easy for you to flag and feel bored on the third or fourth occasion of giving the same presentation, but this feeling of fatigue must be fought against if the presentation is to be successful. If attention is paid to the point discussed next, much of this difficulty will be overcome, because although the subject of your presentation may be the same on consecutive occasions, the participants will be different, giving you some opportunity for variation of approach.

6. HELP IDENTIFY MAIN POINTS

Avoid too much side-tracking, and keep your mind on the main theme of the subject. The question and answer technique to be discussed later can be very effective. Many trainers avoid questioning because of the likelihood of the group getting out of control due to disorderly answering of questions.

A more serious problem for the inexperienced is the side-tracking question. Consciously or unconsciously, participants are in the habit of asking questions not directly related to the subject under discussion, and the wise trainer will steer (rather than drive) the discussion back on the right lines. In this, much tact must be brought into play. It is not helpful nor is it conducive to good relations to ignore or refuse to answer an irrelevant question. The participant, probably having asked the question in all seriousness and unconscious of the fact that it falls outside the topic under discussion, will feel slighted and refrain from further cooperation.

Sometimes a short answer to an irrelevant question will suffice to satisfy the participant, and occasionally a gentle reminder to the effect that his or her point will be dealt with on another occasion will bring you back to your topic. There are times, however, when an irrelevant question might be pursued for a moment or two with great profit to the group. It should be borne in mind that an objective was set out to be achieved when the presentation was started, and this must be successfully achieved in the allotted time.

7. CONSIDER LENGTH

Do not try to expound too many facts in one presentation. Five or six points well consolidated in the minds of the participants are about all they are capable of retaining during one presentation. In any case, if these points are well described and illustrated you will have used up all of the time you have on hand. Keep a weathered eye open for a flagging audience. A sensitivity to the reaction of the group must be developed, and if boredom begins to creep in the atmosphere, it is time to either stop or change tactics. Always be self-critical and be on guard for signs of lack of interest. This will mean developing a method or methods of retaining and revivifying the attention of the group because it is useless to continue talking to a group if the participants are not paying serious attention.

Chlorination System Components Lesson Plan

Fred Delvecchio and Ed Hartmann have prepared an instructional package for the Washington Environmental Training Resource Center at Green River Community College, Auburn, Washington. The package, entitled Chlorination System Components, contains an instructional program, instructor guide, student workbook, panel book for pre- and post-tests, and a post-test. The over-all design of the package is described as follows:

INSTRUCTIONAL PACKAGE WORKSHEET

CURRICULUM: Water Quality Control Program
COURSE: Process Control
UNIT: Gas Chlorination
LESSON: Chlorination System Components
ESTIMATED TIME: Four Hours

Entering Competencies

Although there are no prerequisites for this lesson, it would be helpful if each trainee had some understanding of plumbing.

Objectives

Behavior:	Each trainee will be able to identify and explain the function of chlorination system components.
Conditions:	Given actual components pictures of components, or names of componenets. No notes are to be used.
Acceptable Performance:	Correctly identify and explain the functions of 90 percent of the components presented.

Justification

Almost all water and wastewater treatment plants use chlorine for disinfection.

Operators must be able to recognize and explain the functions of chlorination system components in order to operate, maintain, and repair such systems.

Evaluation Activities

- Pre-test (written)
- Student Workbook (written)
- Post-test (written)
- Hands-on identification of components (optional at instructor's discretion)

Resources

- Instructional Package: "Chlorination System Components."
- Actual chlorination system components, if available.

Instructional Approach

- Give the students the self-administered pre-test and have them grade their own pre-tests.
- Have students work through the instructional program "Chlorination System Components" and complete the student workbook at the same time. Supplement the text with actual components, if available.
- Give the students the post-test.
- Provide feedback to each student regarding his/her performance on the post test.
- If actual chlorination system components are available, have the students practice identifying these.
- Provide remedial training if necessary.

The 141 page instructional program includes a photograph or drawing and verbal description of the function of all components of a gas chlorination system. The contents of the instructional program, objectives of the four hour module, and instructions to students are as follows:

CONTENTS

Chlorination System Overview . . . 9
Chlorine Supply System . . . 10
Overview . . . 10
100 or 150-lb Cylinder . . . 11
Cylinder Valve . . . 12
Valve Cap . . . 13
Fusible Plug . . . 14
Valve Protection Hood . . . 15
Tare Weight Stamp . . . 16
Ton Container . . . 20
Ton Container Valves . . . 21
Valve Caps . . . 22
Fusible Plugs . . . 23
Valve Protection Hood . . . 24
Tare Weight Stamp . . . 25
Valve Wrench . . . 30
Yoke Clamp . . . 31
Union Coupling . . . 32
Auxiliary Valve . . . 33
Gasket . . . 34
Flexible Connector . . . 35
Scales . . . 40
Load Cell . . . 41
Cylinder Restraints . . . 42
Trunnion . . . 43
Manifold (Header) . . . 48
Manifold Valve (Header Valve) . . . 49
Chlorine Gas Filter . . . 50
External Chlor. Pressure Reduc. Valve (CPRV) . . . 51
Automatic Switchover System . . . 52
Chlorine Drip Leg . . . 53
Pressure Gauge . . . 59
Pressure and Vacuum Sensors . . . 60
Diaphragm Seal Unit . . . 61
Manual Shutoff Valve . . . 62
Automatic Shutoff Valve . . . 63
Expansion Chamber . . . 68
Rupture Disc . . . 69
Evaporator . . . 70
Evaporator Pressure Relief System . . . 71
Chlorine Metering System (Chlorinator) . . . 77
Overview . . . 77
Clylinder-Mounted Chlorinator . . . 78
Cabinet-Mounted Chlorinator . . . 79
Chlorine Gas Inlet . . . 80
Inlet Strainer . . . 81
Inlet Heater . . . 82
Chlorine Gas Pressure Gauge . . . 83
Chlorine Pressure Regulating Valve . . . 84
Automatic Pressure-Vacuum Relief Valve . . . 88
Vent Line . . . 89
Vent Line Screen . . . 90
Rotameter . . . 91
Chlorine Rate Control Valve . . . 92
Rate Valve Adjuster . . . 93
Vacuum Regulating Valve . . . 98
Injector (Ejector, Eductor) . . . 99
Chlorine Discharge Line . . . 100
Vacuum Gauge . . . 101
Chlorine Solution Delivery System . . . 106
Overview . . . 106
Water Supply Line . . . 107
Booster Pump . . . 108
Water Strainer . . . 109
Water Pressure Regulator . . . 110
Injector Water Pressure Gauge . . . 111
Manual Water-Supply Shutoff Valve . . . 112
Automatic Water Supply Shutoff Valve . . . 113
Chlorine Solution Discharge Line . . . 118
Chlorine Solution Shutoff Valve . . . 119
Check Valve . . . 120
Chlorine Solution Distributors . . . 121
Corporation Cock . . . 122
Diffuser . . . 123
Contact Basin . . . 124
Accessories . . . 128
Overview . . . 128
Vent Fan . . . 129
Water Flow Monitors . . . 130
Chlorine Residual Analyzer . . . 131
Recorders . . . 132
Chlorine Leak Detector . . . 133
Alarms . . . 134
Self-Contained Breathing Apparatus . . . 135
Emergency Repair Kits . . . 136

MATERIALS

Before you begin to work through this program you'll need the following materials:

- a pen or pencil
- a copy of the student workbook
- a copy of this instructional program

The workbook contains questions about the material presented in this instructional program. When the program refers you to the student workbook, turn to the page indicated and follow the instructions given there. After you answer the questions for that section, return to the instructional program to find the correct answers. Check your answers against those given, and correct any you have wrong. If you need assistance, contact someone who knows about chlorinators. Only then should you continue to the next part of the program.

Later programs will require knowledge of chlorination system components, so keep your completed workbook as a study guide and reference.

If you have questions about the program, see your instructor or another student who has already gone through the program. If you have no questions, turn the page and begin.

OBJECTIVE

When you complete this module you will be able to identify and explain the purpose of at least 90 percent of the components listed in the table of contents. You will be able to do this from memory, with no notes.

NOTES

1. The components described in this module may not be identical to the components at your plant, but the general characteristics and functions will be similar.

2. Any particular installation will not have all the items described in this module.

3. For each component you will find the following information:
    - Name
    - Photo or drawing
    - What it does

4. We've grouped the topics into five logical sets to make it easier for you to work through the module:
    - Overall description of typical Chlorination System
    - Components of Chlorine Supply Systems
    - Components of Chlorine Metering Systems (Chlorinators)
    - Components of Chlorine solution delivery systems
    - Accessories

5. We do not cover the following information:
    - Safety
    - How to operate a particular component
    - How a particular component works

    These are covered in other modules.

6. Mention of brand names does not constitute endorsement of those brands by the people or organizations involved with developing this module.

POST TEST

Question 1

Instructions: In the blank space in front of each name listed below, print the letter of the appropriate picture from the panel book. There are more pictures than names.

DO NOT WRITE IN THE PANEL BOOK.

______ 1. Cylinder valve

______ 2. Fusible plug

______ 3. Tare weight stamp

______ 4. Ton container

______ 5. Valve protection hood

______ 6. Auxiliary valve

______ 7. Flexible connector

______ 8. Trunnion

______ 9. Header

______ 10. Chlorine gas filter

______ 11. Diaphragm seal unit

______ 12. External chlorine pressure reducing valve

______ 13. Expansion chamber

______ 14. Inlet heater

______ 15. Feed rate control valve

______ 16. Rotameter

______ 17. Vacuum regulating valve

______ 18. Injector

______ 19. Water strainer

______ 20. Solenoid vlave

______ 21. Corporation cock

______ 22. Check valve

______ 23. Chlorine leak detector

______ 24. Water flow monitor

______ 25. Contact Basin

Question 2

Instructions: Next to each name in column A, print the letter of the appropriate description from column B.

A

_____ 1. Cylinder valve

_____ 2. Fusible plug

_____ 3. Tare weight stamp

_____ 4. Ton container

_____ 5. Valve protection hood

_____ 6. Auxiliary valve

_____ 7. Flexible connector

_____ 8. Scale

B

A. Portable chlorine vessel that contains 2000-lbs of chlorine.
B. Registers the weight of a chlorine container plus the chlorine it contains.
C. Used to form gas-tight seals at metal-to-metal connnections.
D. Controls the flow of gas from a chlorine container.
E. Used wherever a connection might be subject to movement.
F. Melts if container gets too hot, to protect container from rupturing.
G. Shields chlorine container valves from damage.
H. Indicates how heavy a chlorine container is when it has no chlorine in it.
I. Keeps air out of a chlorine supply line when you disconnect the line from a chlorine container.

Question 3

Instructions: Next to each name in column A, print the letter of the appropriate description from column B.

A

_____ 1. Trunnion

_____ 2. Manifold

_____ 3. Chlorine gas filter

_____ 4. Drip Leg

_____ 5. Pressure gauge

_____ 6. Diaphragm seal unit

_____ 7. External chlorine pressure reducing valve (CPRV)

_____ 8. Expansion chamber

B

A. Lowers the chlorine gas pressure in a supply line to minimize problems with reliquefaction.
B. Shields a sensor or gauge from direct contact with chlorine
C. Indicates the pressure of the chlorine in a system.
D. Provides space to accomodate the extra volume of chlorine produced when the temperature rises.
E. Supplies heat to produce large quantities of chlorine gas from liquid chlorine.
F. Provides a means of connecting more than one chlorine container to a chlorination system at the same time.
G. Removes impurities from chlorine gas, to protect chlorination equipment.
H. Lets you rotate a ton container so you can properly position the valves.
I. Catches droplets of liquid chlorine.

Question 4

Instructions: Next to each name in column A, print the letter of the appropriate description from column B.

A

______ 1. Inlet heater

______ 2. Cylinder-mounted chlorinator

______ 3. Feed rate control valve

______ 4. Rotameter

______ 5. Vacuum regulating valve

______ 6. Vacuum gauge

______ 7. Injector

______ 8. Corporation cock

______ 9. Contact basin

B

A. Controls how much gas flows through the chlorinator.
B. Warms chlorine gas entering the chlorinator.
C. Indicates the rate at which gas is flowing through the chlorinator.
D. Provides detention time for chlorine to kill bateria.
E. Indicates strength of vacuum in chlorine discharge line.
F. Disperses chlorine solution evenly into the flow being treated.
G. Connects a chlorine solution discharge line to a pressurized water line.
H. Controls amount of vacuum reaching feed rate control valve.
I. Generates vacuum that powers chlorinator.
J. Small chlorine-metering device that attaches directly to a chlorine container.

Developing Good Work Habits Lesson Plan

The Technical Publishing Company, 1301 So. Grove Avenue, Barrington, Illinois 60010, (312) 381-1840, has prepared an extensive series of training manuals. The manuals are designed for self-study but could also be used in short-courses or workshops which are organized to develop special skills.

Below the reader will find selected pages from the trainee's guide for Developing Troubleshooting Skills. Pages IV-VIII indicate the content of the course, a description of the TPC Training Systems Courses, and suggestions to the trainee on how he can get the most out of his study. Pages 18-32 constitute lesson number two on the topic "Developing Good Work Habits."

The reader will note that this lesson in a technical training program deals almost exclusively with "humanistic education." Clearly vocational education instructors need to make provision for this kind of learning as well as technical training in their approach to instructional planning.

TPC TRAINING SYSTEMS

DEVELOPING TROUBLESHOOTING SKILLS

Lesson 1

YOUR JOB IN MAINTENANCE

Definition of troubleshooting; Troubleshooting skills; A troubleshooter's duties; Troubleshooting aids; Using test equipment; Mechanical troubleshooting; Electrical troubleshooting; The maintenance function; Maintenance department organization; Maintenance department personnel; Scheduling maintenance work; Challenge of maintenance work.

Lesson 2

DEVELOPING GOOD WORK HABITS

Working with people; The need for people skills; People skills can be learned; People and their behavior; The communication cycle; Aids to communicating; Using a tactful approach; Preventing misunderstandings; Trade responsibilities; Differences of opinion; You and your supervisor; The need to upgrade your skills.

Lesson 3

TROUBLESHOOTING TECHNIQUES

The troubleshooter's job; Recognizing normal operations; How to learn about normal operations; Simple testing and observation; Reducing downtime; Making routine repairs; Making emergency repairs.

Lesson 4

AIDS TO TROUBLESHOOTING

Equipment repairs; Drawings and blueprints; Sketches; Manufacturers' literature; Service representatives; Planned maintenance records; Machinery records and work orders; Electrical test equipment; Mechanical test equipment.

Lesson 5

TROUBLESHOOTING WITH SCHEMATICS

Schematic diagrams are valuable tools; Symbols for schematics; Piping schematics; Compressor and engine piping schematics; Hydraulic and pneumatic schematics; A simple pneumatic circuit; Pneumatic-hydraulic schematics; Electrical schematics; Motor starting circuits; Plant lighting diagrams; Plant lighting controls; Electrical troubleshooting charts; Putting schematics to work.

Lesson 6

BREAKDOWN MAINTENANCE

Definition of breakdown maintenance; How breakdown maintenance operates; Examples of good breakdown maintenance; Work order procedures; Preparing for emergencies; Skills for emergency work; Parts and supplies for maintenance; Breakdowns in automatic machinery; Using downtime profitably; Hardfacing machine parts.

Lesson 7

PREPARATIONS FOR TROUBLESHOOTING

Troubleshooting responsibilities; Tools for troubleshooting; Parts and supplies; Clothing and safety equipment; Safety in troubleshooting; An example of simple troubleshooting; Troubleshooting charts and diagrams; Correcting malfunctions; Keeping maintenance records; Lubrication problems; Power transmission equipment; Drive and conveyor belts; Drive and conveyor chains.

Lesson 8

SOLVING MECHANICAL PROBLEMS

Bearing problems; Pump problems; Piping systems; Flexible hose; Compressed air equipment; Hydraulic systems; Heating, ventilating, air-conditioning; Refrigeration equipment; Pollution control equipment; Building maintenance.

Lesson 9

SOLVING ELECTRICAL PROBLEMS

Electric power generation and distribution; Service entrance equipment; Feeders, subfeeders, and branch circuits; Fuses and circuit breakers; Current capacity of wire; Knowing basic principles; Diagnosing trouble; Testing for continuity; Electrical safety; Communications and diagrams; Troubleshooting with diagrams; Electrical instruments and measurements; The industrial electrician.

Lesson 10

PLANNED MAINTENANCE

Planned maintenance defined; The need for planned maintenance; Frequency of planned maintenance; Frequency of lubrication; Benefits of planned maintenance; Unscheduled maintenance; Items requiring planned maintenance; Keeping maintenance records; Keeping inspection records; Lubrication; Using lubrication charts; Lube point numbering, color coding.

TPC TRAINING SYSTEMS COURSES

You are about to begin a way of studying that may be a new experience for you. TPC Training Systems courses are designed for self-study. That means that you don't need a classroom or a teacher to learn what's in this unit. You can learn any place and any time that is best or convenient for you. And you can learn as fast as you can, or take as much time as you need.

Regardless of how you have studied before, take time to read the few pages in this Guide. They will tell you how this self-study unit can help you learn better and faster than you ever have before. And they will tell you how to get the most from your course of study. You will find suggestions that will help you: to learn and retain what you have read, to increase your ability to concentrate during your study time, and to organize and relate what you have learned to your job.

HOW THE COURSE WORKS

Each TPC Training Systems course is designed to be administered by someone in your company, and is completely self-study in form. Your company may offer you additional training: practical shopwork, films, and manufacturer's presentations. Make full use of whatever training aids are available to get as much benefit from the course as you can. Ask your supervisor for assistance when you need it. He in turn can call upon TPC Training Systems for assistance. Help is available to you just for the asking.

HOW THE COURSE IS ORGANIZED

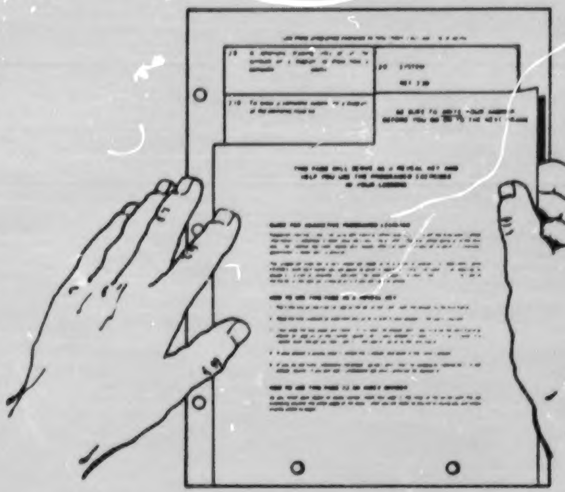
Each TPC Training Systems course is made up of one or more units. Each unit contains several **lessons** covering an important part of your maintenance training. Each lesson consists of text, programed exercises, and a self-check quiz. All of this material is designed for you to study on a personal basis.

Each lesson may take you anywhere from one and one-half to two and one-half hours to complete. How much time you spend on it depends on your previous knowledge and experience. The amount of time you spend is not as important as *how well you retain what you learn*.

Because each unit is designed to be a workbook, write in your answers to the questions asked. Make notes and sketches in the margin if you want to. It is your training manual. It contains many charts and tables that will be valuable as reference material after you complete the course. Hang on to this unit. It will be helpful to you many times in your future work.

Lesson Organization

Each lesson consists of two or three sections of text, with pictures, tables, and graphs. Each section is followed by a set of programed exercises. Reference tables or a summary of key points you learned in the lesson may be included near the end of the lesson. The last two pages always contain a self-check quiz and the answers to the quiz. How self-checking can help you retain what you learn is explained later under "Self-Check Quizzes."



Programed Exercises

Each set of **programed exercises** consists of a series of questions, incomplete statements, or short problems, combined with the right answers. Each exercise requires you to write a response in the space provided—or, in some cases, make a simple sketch. The correct answer is located in the column printed in color next to each exercise.

The **reveal key** furnished with each unit is designed to show the exercise you are working on, but also to cover that exercise's answer. Place it on the programed exercise page as shown in the picture. Use a pencil to write in your answer in the space provided. Then move the reveal key down one frame, and read the correct answer in the column printed in color. If you have made a mistake, erase your answer, and *reread* the paragraphs and study the figures referenced just below the correct answer. These references contain information that will lead you to the right answer. Then return to the exercise you missed, read the question, statement or problem again, and write in the correct response as you now understand it. If you feel that your response is equally as correct as the one given, check with your supervisor.

It is important that you write your response in the space provided *before* you look at the correct answer. Do not take the obvious short cut—merely reading the answers to the programed exercises—because you will actually reduce the amount of information that you learn and retain. The number of lines to be filled in will tell you how many words are in the answer. In most cases, you should know the correct answer and not need this hint. Do not depend on the length of each line to guide you to the right answer. Select your response and write it in *before* you uncover the correct answer.

THE TPC TRAINING SYSTEMS TESTING AND CERTIFICATION PROGRAM

The tests designed for each unit in the course will help both you and your supervisor to evaluate *your individual progress* during *your course of study*. You will not be compared with anyone else. These tests only measure how well *you learned the subject material*. All of the tests contain multiple-choice questions only, with four answers to choose from. The TPC Training Systems testing program includes:

Unit Pre-Tests—These help your company determine your training requirements. TPC Training Systems developed the pre-test that you may have already taken before you were given this training unit. The results of this pre-test make it possible for your company to choose the training that you need to become a more effective maintenance worker.

Self-Check Quizzes—These are the quizzes that you take and grade yourself, without fear of failure or embarrassment. They are included at the end of each lesson to help you determine what you have learned from the lesson. Like the programed exercises, the other purpose of the self-check quiz is to reinforce what you have learned. When you take the self-check quiz, circle your answers right on the quiz page. The correct answers are printed on the reverse side of that page. If you circled a wrong answer, restudy the material as described earlier under "Programed Exercises." For best evaluation and reinforcement, *do not check* your answers until *after* you have completed the quiz.

End-of-Unit Tests—You will be given one of these tests by your supervisor after you complete each unit in the course. These tests consist of questions based solely on the material contained in the lessons. You will probably be able to complete an end-of-unit test in an hour, but don't worry if you aren't as fast as some of your fellow trainees. Getting the right answer the first time is more important in the long run than giving a quick answer.

Completion Certificates—After you successfully complete a unit—including the end-of-unit test—you will receive a TPC Training Systems certificate of unit completion from your supervisor. Upon successful completion of the entire course, you will receive a certificate of course completion from TPC Training Systems. These certificates are recognized throughout industry as evidence of sound training in the skills involved.

BROADENING YOUR KNOWLEDGE AND SKILLS

If you would like more information on a subject, or you would like to study certain topics in more depth, your supervisor can provide you with the list of supplementary reading prepared by TPC Training Systems.

HOW TO GAIN THE MOST FROM YOUR COURSE OF STUDY

Your training unit contains all the material you need to learn the subject—no textbook or other materials are necessary. Certain basic principles and theories are essential to your understanding of the subject matter, and the jobs you will perform in maintenance. In this unit every effort has been made to make these principles and theories understandable, and to relate them to your job.

Each of the lessons in this unit has been carefully planned to make your understanding of the subject matter as easy as possible. But to really get the kind of knowledge required to do your job well, *you must make a determined effort*. The responsibility for learning is on *you*.

ESTABLISHING GOOD STUDY HABITS

Completing the unit successfully depends on your developing good study habits. Try to set aside a period of time each day to study, in an area where you can concentrate without being disturbed. Select the time of day when you ordinarily feel good—a period when you can concentrate comfortably. If you can't study in a quiet area at the proper time, find an area where you can at least study without being bothered. In most cases, your company will provide such an area.

How you apply yourself to your first lesson is important: *Work carefully while you familiarize yourself with the study method.* Once you become familiar with how the material is presented, you can set your own speed in completing the lessons. To get the most out of the lessons, try the following:

Step One—At the beginning of a training session or study period, quickly go through the lesson in this manner:

A. Read just the titles, headings, and subheadings. See if you can recognize how they are related and how they are arranged.

B. Look at the pictures, tables, and graphs, and read the captions. See what is familiar to you and what isn't.

C. Then proceed, page-by-page, reading just the first and last sentences in each paragraph.

You should be able to complete this preview in as little as five or ten minutes. These few minutes will give you a good idea of the important points, and you will know what to expect as you begin to really study the material. When you quickly survey each following lesson, you can see how the new material ties in with the material you have already learned.

Step Two—Now start studying the lesson. Read each paragraph carefully, and study the pictures, tables, and graphs. Be sure you understand what each sentence says. Look up words whose meanings you are unsure of in the dictionary. After each paragraph, stop and think about what you have read. In your own mind, put into words what you have learned.

Step Three—Write down what you have learned. This will help you remember it better. If you don't have time to write things down, at least underline the important points. Then, when you review the material, you will be able to spot them easily. Do not underline too many points. Try to distinguish between main points and ones that are minor. You can tell some of the main points simply by the stress placed on them. New terms and important concepts are often printed in **very black type**, in *italics*, or in CAPITAL letters. Other main points are made apparent by what the words say: "It is important to" or "Be sure to."

There are various ways of marking the text. You can identify important points by using different colored pens or pencils. Other important points can be enclosed in brackets. You can also identify important points by numbers or letters. Be sure you have a reason for making your marks, however, because the marks alone do not indicate that you are learning.

Do not underline the important points or make notes until *after* you have read a paragraph or page of text material. If you start writing notes or underlining material as you read each sentence, you may miss some of the important relationships in the subject.

Step Four—Before you take the self-check quiz, review the programed exercises and the key points in the lesson. The underlining and notetaking you have done will help.

After you complete all of the lessons in a unit, make a careful review of the key points, programed exercises, and self-check quizzes again. After your final review, you are ready to take the end-of-unit test. If, in your final review, you find that some subject areas are still not clear to you, reread the material and go over it with your supervisor if possible.

IMPROVING YOUR READING HABITS

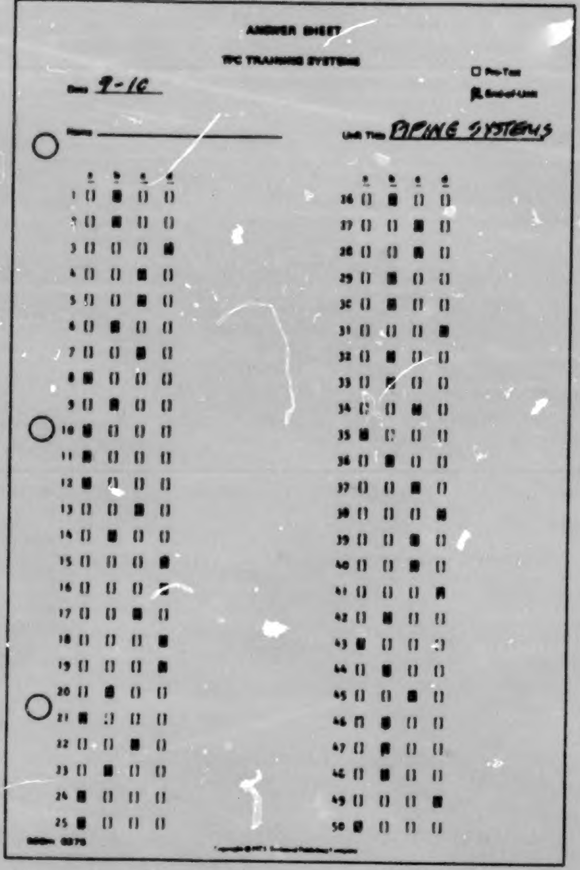
You can increase your reading speed and save study time—without reducing your understanding—if you make yourself read faster. As you read, try to see more than one word. Try to see phrases or groups of words. Think of the meaning of the phrase you have just read, rather than the meaning of each word. Many people repeat the words to themselves as they read. This actually reduces reading speed. Make a note of how long it takes you to read and understand a page in your lesson. Then try to do better on the following pages. Although you may not see much change at first, you will soon increase your reading speed, and still understand what you are reading.

HOW TO TAKE THE END-OF-UNIT TEST

All end-of-unit test questions are multiple-choice. These are the same kind of questions that you will answer in the self-check quizzes. Because you will answer this kind of question many times before you take the end-of-unit test, you will have a lot of practice and the end-of-unit test will be familiar to you.

Multiple-choice questions consist of a direct question or an incomplete statement followed by four possible answers. Only one answer is correct. In some cases, this may be "d. All of the above." Remember: You are allowed to mark only *one* choice on the answer sheet shown—make it your best choice.

Read each question and the possible answers carefully. If the answer that first comes to mind does not appear among the choices, reread the question and the answers. If you still cannot determine what the answer is, go on to the next question. Then, after you have gone through all of the questions, go back to the questions you were not able to answer. It should be easier to select the right answer then.



ANSWER SHEET

TPC TRAINING SYSTEMS

Date 9-10

☐ Pre-Test
☒ End-of-Unit

Name ____________

Unit Title PIPING SYSTEMS

	a	b	c	d		a	b	c	d
1	☐	■	☐	☐	26	☐	■	☐	☐
2	☐	■	☐	☐	27	☐	☐	■	☐
3	☐	☐	☐	■	28	☐	☐	■	☐
4	☐	☐	■	☐	29	☐	■	☐	☐
5	☐	☐	■	☐	30	☐	■	☐	☐
6	☐	■	☐	☐	31	☐	☐	☐	■
7	☐	☐	■	☐	32	☐	■	☐	☐
8	■	☐	☐	☐	33	☐	■	☐	☐
9	☐	■	☐	☐	34	☐	☐	■	☐
10	■	☐	☐	☐	35	■	☐	☐	☐
11	■	☐	☐	☐	36	☐	■	☐	☐
12	■	☐	☐	☐	37	☐	☐	■	☐
13	☐	☐	■	☐	38	☐	☐	☐	■
14	☐	■	☐	☐	39	☐	☐	■	☐
15	☐	☐	☐	■	40	☐	☐	■	☐
16	☐	☐	☐	■	41	☐	☐	☐	■
17	☐	☐	■	☐	42	☐	■	☐	☐
18	☐	☐	☐	■	43	■	☐	☐	☐
19	☐	☐	☐	■	44	☐	■	☐	☐
20	☐	■	☐	☐	45	☐	☐	■	☐
21	■	☐	☐	☐	46	☐	■	☐	☐
22	☐	☐	■	☐	47	☐	■	☐	☐
23	☐	■	☐	☐	48	☐	■	☐	☐
24	■	☐	☐	☐	49	☐	☐	☐	■
25	■	☐	☐	☐	50	■	☐	☐	☐

After you have answered all the questions, review the test before turning it in. It is easy to make mistakes in a test. You may have misread the question or simply not have checked the answer you intended.

Remember: The tests in this unit are not competitive examinations. *You are competing only with yourself.* You can take the tests with confidence if you are well prepared.

Lesson Two — Developing Good Work Habits

CONTENTS

Page

Preface 19

Working with People 19
The Need for People Skills 20
People Skills Can Be Learned 20
People and Their Behavior 20
The Communication Cycle 21
  Programed Exercises 22

Aids to Communicating 23
Using a Tactful Approach 24
Preventing Misunderstandings 24
  Programed Exercises 26

Trade Responsibilities 27
Differences of Opinion 27
You and Your Supervisor 27
The Need to Upgrade Your Skills 28
  Programed Exercises 30

  Self-Check Quiz 31
  Answers to Self-Check Quiz 32

© Copyright by Technical Publishing Company,
A Division of Dun-Donnelley Publishing Corporation, A Dun & Bradstreet Company,
Barrington, Illinois, 1974—all rights reserved, including those of translation.

No part of this material may be reproduced in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system. Technical Publishing Company does not, by publication of data in this manual, ensure to anyone the use of such data against liability of any kind, including infringement of any patent. Publication of any data in this manual does not constitute a recommendation of any patent or proprietary right that may be involved.

Printed in the United States of America.

Lesson Two — Developing Good Work Habits

Preface

Maintenance craftsmen must keep complex and costly machinery operating efficiently so production schedules can be met. It is necessary to have good personal relationships between craftsmen because a team effort is needed to perform effective maintenance and troubleshooting.

As a trainee, you have the opportunity to work with experienced men who are usually experts in their fields. You can gain from their knowledge and instruction and become a better craftsman. This lesson explains the relationship that should exist between you and your co-workers. It also tells how you can improve your troubleshooting skills.

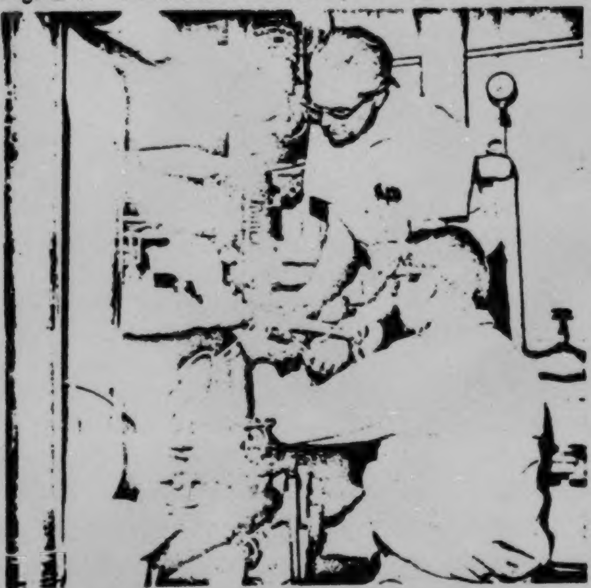
Your relationship with your supervisor is especially important. Your promotions depend largely on what he tells management about your abilities and work attitudes. You must learn to accept your supervisor's orders and instructions, and also his criticism. You can profit from his years of experience working with men and tools.

Working with People

2.01 In performing his duties, the troubleshooter comes into contact with many people. By talking with them or by writing reports, replies, and recommendations that they will read, he communicates with them. Frequently, he must work closely with others to diagnose a malfunction and make repairs (see Fig. 2-1).

2.02 Often, contacts with other people take place when they are under strain. This may be because of emergency conditions, or due to some other factor. In these cases, your co-workers may not behave as they normally would. They often seek to hide their true feelings, making it difficult for you to find the real reason for what they say and do.

Fig. 2-1. Teamwork makes a job easier.



2.03 For example, you may find that some workers are angry, possibly because their machine stopped and they are losing piecework pay. Or, they have just been criticized for poor work, and they feel it is unfair. Other workers become worried they will be injured by a malfunctioning machine; still others fear they may be laid off if the production line breaks down. Some people are skeptical about the installation or use of safety devices, and many try to prevent any change in the way they do their work.

2.04 Though your most frequent contacts as a troubleshooter will be with your supervisor and other maintenance craftsmen (Fig. 2-2), you will come in contact with others in the plant. For example, you must often ask stores personnel to get parts and supplies. You will also have regular contacts with production workers. At times you may also have to explain work stoppages, needed repairs, or replacements to the plant superintendent or top management.

The Need for People Skills

2.05 Your ability as a troubleshooter depends to a great extent on your skills in handling *things*—parts, tools, and equipment—required for installation and maintenance. However, it is equally important your troubleshooting skills include the ability to handle *people* as well. How you work with people determines your success on the job just as much as how you use tools and machinery.

2.06 When others are not willing to cooperate with you, your job becomes more difficult. If your co-workers are not willing to assist you, you may not get the information you need. Your success as a troubleshooter, therefore, depends on your people skills (see Fig. 2-3). While your technical skills are your greatest need now, every promotion to a higher position means a greater need for people skills. The higher you advance, the more important these skills become.

Fig. 2-2. Your work often brings you into contact with other workers.

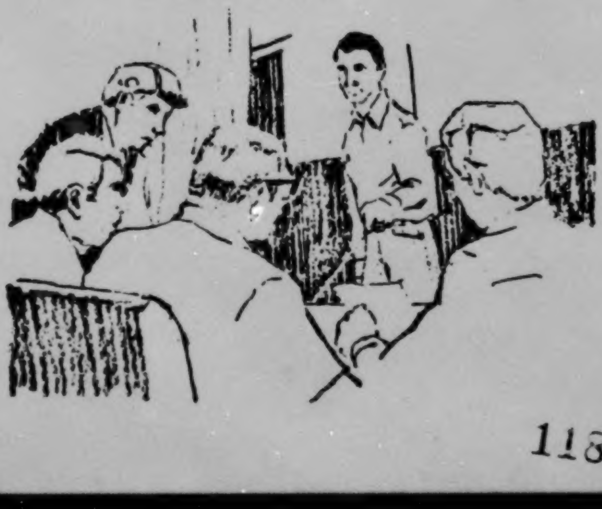


Fig. 2-3. Success in working with others leads to successful troubleshooting.

People Skills Can Be Learned

2.07 Some craftsmen find it difficult to admit they need to improve their ability to get along with others. Unfortunately, they feel admitting they could improve is admitting they have failed in some way. The one who REFUSES to improve is the one who really is a failure.

2.08 To improve your people skills, you must study and practice them, just as you might study how to replace a bearing, and then practice doing it. Each time you practice a skill, you do it better and become more natural or instinctive about doing it. The same is true of people skills. If you study them but never use them, your relations with your co-workers will not improve.

People and Their Behavior

2.09 To improve your people skills, you need to know more about the things that are important to other people. Most people have developed beliefs and feelings that determine their actions in almost every situation. For them, their beliefs are real. It makes no difference whether their beliefs are real to anyone else. For example, a co-worker may feel that he must act tough to be respected. He talks, looks, and dresses tough, but may be a very gentle person. His belief that he must act tough determines how he will react to you and other people.

2.10 A person usually sees himself in three ways: the person he feels he really is, the person he wishes he were, and the person he feels other people actually see him to be. The first (the person he feels he is) is usually not what he would like to be; he may try to hide this person from others. The second (who he wishes he were) he feels he can never be, but he wishes others *would* see this person in him. The third (the person he feels others *actually* see) is generally unsatisfactory to him: he wants to be seen as being more capable and admirable. To improve others' opinions of him, he may use expressions and language that are ordinarily not a part of his personality. He tries to communicate a different impression of himself to others.

2.11 People also indicate their thoughts by such actions as shrugging their shoulders, shifting their weight, and drawing themselves up to full height. This "body language" may tell more about how they feel than the words they use because most people have been taught to control what they say.

2.12 For example, a person disagreeing with another may set his jaw tightly, making the sinews in his neck stand out like wires. He makes his fists tight even though they hang at his sides and he may lean forward on the balls of his feet like a boxer. He really does not need to say a word about how he feels!

The Communication Cycle

2.13 A person must have an attentive listener to communicate. People communicate *with* another person, not *to* him. A speaker does not communicate until the listener lets the words become a communication or message. The listener is actually the communicator because he determines if the "message" is to be received. It isn't necessary to talk loud and long or cleverly to be heard. But it is helpful to shut out as many of the distracting sounds in the plant as you can to get through to the listener.

2.14 Communication is a cycle of speaking, listening, responding to the speaker, and a reaction to the response (see Fig. 2-4). If any of these steps fails or is not completed, the cycle is incomplete and a breakdown in communication results.

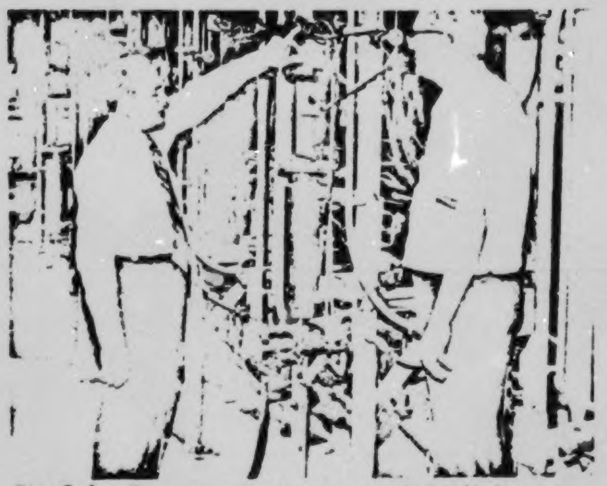


Fig. 2-4. The communication cycle includes BOTH speaking and listening!

2.15 **Speaking**. A speaker can say something with words (an order, a request, a suggestion) and with gestures or actions (raising his eyebrows, pointing to a machine). The information he gives through words or actions reveals his feelings about a situation. For example, it is easy to tell if a supervisor is pleased because the job was completed on time or displeased because carelessness caused delays.

2.16 **Listening**. A good listener first gives the speaker his attention, then he "processes" what he sees and hears, that is, absorbs whatever part of what is said that he wishes. The speaker has no control over the thought processes or personal experiences the listener uses as a basis for processing the information.

2.17 **Response**. After he processes the information, the listener reveals what he absorbed by his words or actions. He may smile–or scowl. He may ask questions, or walk out of the room without saying a word, apparently satisfied.

2.18 **Reaction**. The speaker can determine if the listener processed the information correctly by the listener's response. The speaker must then decide if more information is needed. Sometimes the cycle must be repeated for the speaker and listener to understand each other.

Use these programed exercises to help check your learning progress.

2-1. To diagnose a malfunction and make repairs effectively, a good troubleshooter must know how to work with ________.	2-1. PEOPLE This is very important! REF: 2.01
2-2. As a troubleshooter, your most frequent contacts will be with other maintenance craftsmen and your ________.	2-2. SUPERVISOR REF: 2.04
2-3. The ability to work with people as well as tools and equipment determines your success as a ________.	2-3. TROUBLESHOOTER REF: 2.05
2-4. Every promotion to a higher position means a greater need for ________ skills.	2-4. PEOPLE REF: 2.06
2-5. Most people have beliefs and personal ________ that determine their actions in almost every situation.	2-5. FEELINGS REF: 2.09
2-6. Sometimes people convey their thoughts more clearly with ________ language than with words.	2-6. BODY REF: 2.11
2-7. Communication takes place only when the ________ lets the spoken words become a message.	2-7. LISTENER REF: 2.13
2-8. Speaking, listening, the listener's response, and the speaker's reaction are all part of the ________ cycle.	2-8. COMMUNICATION REF: 2.14, Fig. 2-4

Aids to Communicating

2.19 The speaker's choice of words has much to do with the response he receives. Before asking a question, think about the answer you want. In work situations, specific words are better for communicating than general terms because they shorten the time and effort required to get the right results. "Get me a 10-inch crescent wrench" will get the job done faster than "get me a wrench." The helper may get a pipe wrench!

2.20 If you want other people to accept your ideas, you must sell those ideas in such a way that they will be accepted without argument or hostility. A worker may very well become angry when his supervisor asks, "Why are you using that machine without a guard?" But if the worker is simply told, "This guard prevents injury to your fingers," he won't become angry, and important safety information will be communicated.

2.21 Ideas can be communicated effectively in the shop by following these simple guidelines:

1. Use all the evidence you can to win your point.
2. Lead a person from what he knows and accepts to what he doesn't know or accept.
3. Present only one new idea at a time.
4. Make sure the listener understands.
5. Reflect another's feelings.
6. Summarize the information another person gives you, or ask him to summarize your information.

2.22 Evidence can be used to convince a listener who may not accept the speaker's statements at face value. This method can be applied on the job, by quoting your supervisor or an instruction manual, or by relating a previous experience on similar equipment. A simple statement like "The Welding Association recommends that. . ." helps reduce heated arguments. The listener can direct his argument to the Association if he wishes, but he can't logically direct it to you.

2.23 Other good approaches are "In my experience I have found. . .," or "I have seen the same thing happen when. . .," and "Many craftsmen have found they can reduce downtime by. . ." These approaches help the listener accept new information. If he must argue, he must argue with the facts–not the speaker.

2.24 In leading a person from known and acceptable information to the unknown or unacceptable, you can get him to agree with several statements of fact, and then to agree with a new statement based on those facts. "You can see these bearings are worn on the side nearest the motor. Don't you agree?" Then, "It appears that side pressure was exerted on the shaft. Right?" Then, "The other units like this are getting twice the bearing life. Don't you agree?" Finally, "Now, would you agree the belt could have been too tight?" Backed up with evidence from the instruction manual, you can now offer to your skeptical co-worker practical suggestions for adjusting the belt.

2.25 Present only one new idea at a time, not a bunch of them. You must be sure the listener fully accepts one idea before presenting the next one. Because if your listener disagrees with just one idea, he is likely to throw them all out. If he doesn't "get" the first idea, he may miss all the rest of them because he's still thinking about the first one.

2.26 Make sure the listener understands by asking him questions. Ask in such a way that the listener will give you the information you need to determine if he has understood you. It is better to ask, "How (or why) do you think this arrangement will reduce cleanup time?" than it is to ask, "Do you think this cleanup plan will work?" The latter can be answered by a simple yes or no. But, when the listener must reply in his own words, he has to think about the subject, so your message has a much better chance of being understood.

2.27 Reflecting another's feelings means letting him know you recognize his feelings, without saying that you agree or disagree with them. Reflecting another's feelings can take the form of expressions such as "Boy, you sure were angry when that

121

belt snapped!" or, "These new specifications are really different, aren't they?" Your co-worker's replies to these statements tell you more about him than anything else. Workers given a chance to express their feelings often become more proficient, productive, and easier to work with.

2.28 Summarizing information is telling the speaker how you processed the facts he gave you. Restate what you think he said in your own words: "You said that when the breakdown occurred, first the machine vibrated excessively, then a scraping sound came from the shredding chamber, and then it stopped as if jammed. Is that correct?" Summarizing tells the speaker that what he had to say was important. It also gives him the opportunity to add facts he may have unintentionally omitted.

Using a Tactful Approach

2.29 Being tactful helps relieve pressures and makes a job more pleasant. In the average workday, there are usually enough malfunctions and breakdowns to create confusion and make tempers flare without the addition of caustic comments. Whatever your position in the maintenance department, you can learn to direct comments and criticisms to others without annoying them. Consider how you would feel if statements like these were directed to you:

- You made a mistake on this plug. It's undersize!
- Can't you find another place for these cables? I'm always tripping over them.
- You're stupid! Don't you know enough to grease those bearings every day?

2.30 Such statements can hurt or anger a listener. Yet this is the way many people talk to each other. With a little thought, a person can communicate the same ideas without angering the listener or stirring up an argument. Would any of the following statements make you angry if they were directed to you?

- This plug seems to be undersize. Do you think we can prevent this problem in the future?
- If we could make a wall rack for hanging these cables, it would give us more space.
- These bearings require lubrication every day, but they appear to be dry. Have you been furnished a lubrication chart and the right lubricants?

2.31 The secret here is to direct your comments to the item, not to the person. "This machine," "these bearings," and "that part," all direct attention away from the listener and to the "item." Ask the listener to help. Phrases like "Can we avoid?" and "Do you think?" make the listener feel he is a part of the solution and not a part of or the cause of the problem.

Preventing Misunderstandings

2.32 Following orders is usually thought of as one of the easiest things to do to prevent misunderstandings: simply do as you're told, do it cheerfully, and do your best. This may be true, but from the communications standpoint, the real question is knowing what you were told to do. One of the best ways of preventing misunderstanding in following an order is to read the order out loud, and get agreement with your supervisor about what is meant. It is too easy to mistakenly tear down lathe number 24 when the order was for number 42 (see Fig. 2-5).

2.33 When possible, get your orders in writing so you can refer to them later (see Fig. 2-6). Carry a note pad and pencil; when you are given an order, copy it down in brief, and repeat to your supervisor what you have put down. He will know that you have the order as he stated it. Few things upset supervisors or leadmen on the job as much as failure to follow their orders. Writing an order down helps prevent these misunderstandings.

2.34 Transmitting instructions accurately to others is also very important. If your supervisor gives you a message to deliver to another craftsman, *always* tell the receiver the source or authority for the message. "The plant superintendent says to shut down the number one boiler" is far more effective than "You've got to shut down that boiler right away." If the message is complicated, even

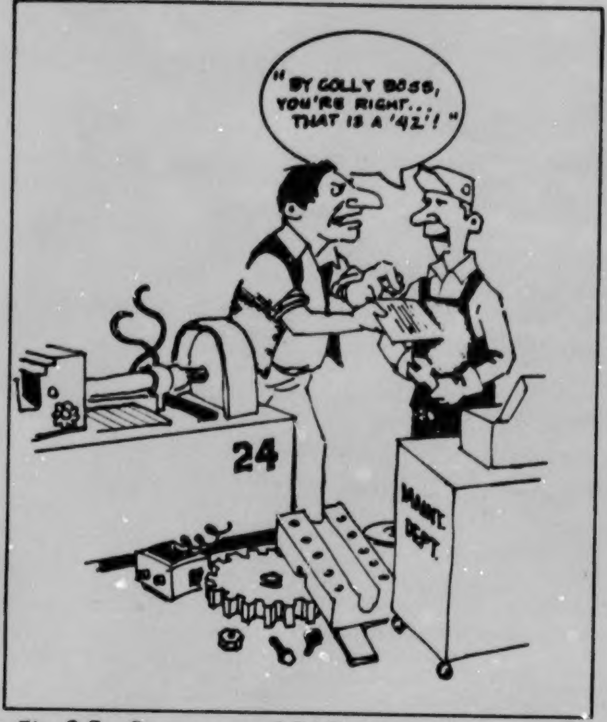

"BY GOLLY BOSS, YOU'RE RIGHT... THAT IS A '42'!"
24
MAINT. DEPT.

Fig. 2-5. Be sure you READ your orders!

slightly, write it down and read it back to the person giving it to you. If possible, read the message to the listener, or let him read it. People remember what they both hear and read much better than what they simply hear.

2.35 Giving instructions can be difficult for a worker who has never done it before. You can get your listener to follow your instructions if you show him they are for his benefit. "You can keep this from leaking again if you pack it this way" tells the other fellow how he benefits: he won't have to repeat the job. People are usually slow to make a change unless they can see that it is to their advantage.

2.36 Occasionally you may have difficulty finding the information you need for a job. Some workers, especially older ones, are hesitant to reveal their "secrets." They sometimes feel that if they tell what they know to trainees, the younger men will replace them. This is seldom true today because industry's investment in qualified men is too great. Management realizes that replacing a skilled man with many years of service left is as unprofitable as discarding a machine that isn't worn out yet.

Fig. 2-6. Have your orders in writing if possible.

2.37 If you make an older worker feel you are out to get his job, he isn't going to help you. But if you approach him with respect, he may be pleased to help. "I wonder if you can help me" will usually get better results than "show me how to do this!"

2.38 A troubleshooter should also always be tactful and pleasant when requisitioning repair parts from the stores department. When the request is routine, stores personnel follow normal channels and procedures. In an emergency, however, you may have to ask the storekeeper to drop what he is doing and help you. But don't make him feel that you are ordering him around. The order he was filling probably came from someone higher than you.

Use these programed exercises to help check your learning progress.

2-9. When giving instructions or making requests, time and effort can be saved by using ________ ________ instead of general terms.	2-9. SPECIFIC WORDS REF: 2.19
2-10. By quoting an instruction manual to convince a listener, a speaker is using ____________ to make his point.	2-10. EVIDENCE REF: 2.22
2-11. To make sure you are understood, ask your listener questions that he can answer in his own ________.	2-11. WORDS REF: 2.26
2-12. By directing critical comments at a machine or piece of equipment and away from the person, a worker is using ________.	2-12. TACT REF: 2.29, 2.31
2-13. It is best to have your instructions or orders in __________ so you can refer to them later.	2-13. WRITING REF: 2.33, Fig. 2-6
2-14. Another worker is more likely to accept an order if you tell him who ______________ it.	2-14. AUTHORIZED REF: 2.34
2-15. To cause a listener to want to follow your instructions, explain how they will __________ him.	2-15. BENEFIT or HELP REF: 2.35
2-16. Older, more experienced workers will be more willing to help you if you treat them with __________.	2-16. RESPECT REF: 2.37

Trade Responsibilities

2.39 As a troubleshooter, you may have to do many types of work: mechanical, electrical, welding, carpentry, and painting. Although you may be qualified for all of these jobs, ask your supervisor about the duties of each trade. In an emergency, most workers can prevent serious breakdowns of expensive equipment. But repairs and emergency work may have to be done by the separate trades. The policy varies from company to company.

2.40 A clearly defined policy on trade responsibilities is usually part of a union contract. A troubleshooter trying to do a good job could violate union policy and cause a major disagreement between the union and management. No company wants a situation like this to develop. You can easily prevent it by asking a few questions in advance. The handbooks and orientation material a company gives to new employees state the company's policies and work rules clearly. So be sure to read the materials you are given.

Differences of Opinion

2.41 When a difference of opinion occurs, most people wish the other person would suddenly change his mind and see it their way. But if you wish to change the situation, you usually must change your own approach.

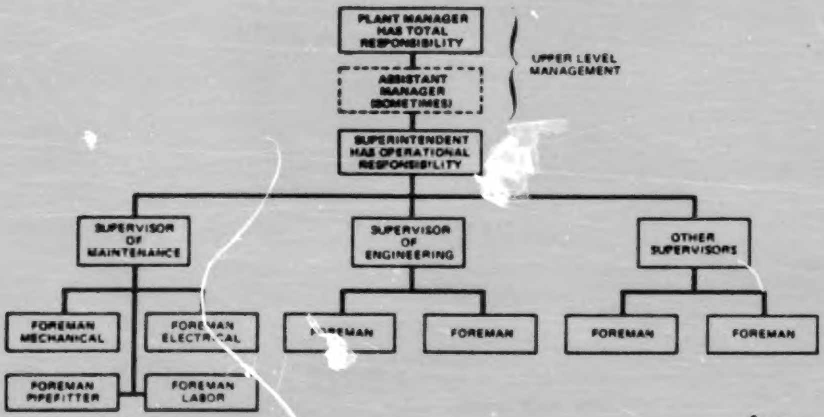
2.42 Many differences of opinion can be corrected quickly if you FIRST find out what the other person feels. As stated earlier, let him know you recognize his feelings and that you are concerned about them. Let him blow off steam. When he calms down, he may be more likely to become concerned with your feelings. Then you should be able to ask questions and communicate more easily.

You and Your Supervisor

2.43 Although your work as a troubleshooter will bring you into contact with many people throughout the plant, your closest personal contact will be with the maintenance department supervisor or foreman. The department works as a team under his direction. He gets his orders from management "higher up" in the plant structure (see Fig. 2-7). He is responsible for providing leadership, issuing orders, coordinating work efforts, teaching craftsmen their jobs, and making recommendations for promotion. You, therefore, owe it to yourself to cooperate with your supervisor and to do a good job.

2.44 The maintenance supervisor must keep production machinery operating efficiently with a minimum of work stoppages. To do this, he must see that planned maintenance inspections are made on schedule. When stoppages do occur, he dispatches an emergency crew and makes sure they have the necessary tools and materials for making repairs. He is responsible for getting work done *safely* and *on time*. He must also maintain good working conditions for his men and make regular reports to management on the department's ac-

Fig. 2-7 Plant management organization showing position of supervisor.


PLANT MANAGER HAS TOTAL RESPONSIBILITY
UPPER LEVEL MANAGEMENT
ASSISTANT MANAGER (SOMETIMES)
SUPERINTENDENT HAS OPERATIONAL RESPONSIBILITY
SUPERVISOR OF MAINTENANCE
SUPERVISOR OF ENGINEERING
OTHER SUPERVISORS
FOREMAN MECHANICAL
FOREMAN ELECTRICAL
FOREMAN PIPEFITTER
FOREMAN LABOR
FOREMAN
FOREMAN
FOREMAN
FOREMAN

tivities. Some of his many duties are listed in Table 2-1.

2.45 You will often make your own decisions as a maintenance craftsman, and later, as a troubleshooter. When your decisions conflict with your supervisor's orders, however, you should follow his instructions. Report any problems or complaints to your supervisor, not to his superior. Let your supervisor know when conditions on the job cause you stress. For example, if an improper tool is causing you to be irritated, your supervisor can get you a proper tool. Remember, your supervisor is available to instruct and coach you. Following his advice will help you to do better work and thus make you a more satisfied craftsman and individual.

The Need to Upgrade Your Skills

2.46 Plant management knows it cannot keep up with competition if its equipment is old and frequently breaks down. Yet 60 percent of this country's machinery is more than 10 years old, and much of it is considered obsolete. Skilled maintenance craftsmen are especially needed to troubleshoot and repair breakdowns in older equipment because of undocumented modifications in the machines and an absence of blueprints and spare parts which call for skill and inventiveness when making repairs.

2.47 Just as the value of a machine increases when it is rebuilt, so does the productivity of a worker increase when his skills are upgraded through educational programs. Troubleshooters and other members of the maintenance team such as machinists and millwrights must continually acquire new knowledge to deal with new and complex machinery. The electrician's skills have perhaps changed more than those of other craftsmen because of the introduction of electronic controls and other devices.

2.48 Mechanics and pipefitters, though they are skilled, require new training to deal with the latest developments and refinements in high-pressure hydraulic systems. In addition, few lubricaters and oilers have the skills needed to maintain complex lubricating systems and protect expensive new high-speed equipment and machinery. To provide continuing education and training for new as well as older workers, management offers various in-plant programs.

2.49 Training helps workers improve themselves by introducing them to unfamiliar machinery and teaching them new skills (see Fig. 2-8). For example, if a plant receives a new piece of equipment, those workers who will repair or service it should learn as much as possible about it. Maintenance manuals are furnished with almost all new equipment; the workers should read the maintenance manuals and the installation and operation requirements of the machine. They should talk to the manufacturer's representative and check the plant

Table 2-1. Some of the Duties of a Maintenance Supervisor or Foreman

Responsibility	Duties	Responsibility	Duties
Meeting Schedules	Executes instructions from management. Studies job specifications and drawings. Establishes schedules for doing work. Plans daily work; assigns jobs to men. Checks progress of jobs regularly. Plans for unexpected emergencies. Anticipates work load and labor needs.	**Work Quality**	Maintains quality work standards. Supervises work of quality inspectors. Recommends changes in work standards. Studies factors that affect quality. Appreciates good work done by the team. Constantly campaigns to reduce rejects. Seeks ways to avoid wasting materials.
Personnel Activities	Interviews and hires trainees, workers. Checks workers' performance on the job. Informs workers of their on-job progress. Arranges merit reviews and pay increases. Recommends qualified men for upgrading. Recommends discharge of inferior workers. Keeps posted on all company regulations.	**Operating Costs**	Helps establish department's budget. Studies department's expense records. Tries to keep expenses within budget. Reports reasons for over-spending. Takes steps to avoid over-spending. Promotes cost reduction projects. Controls overtime and lost-time payments.
Working Conditions	Maintains good housekeeping practices. Fosters clean, safe working conditions. Emphasizes observance of safety rules. Investigates accidents and makes reports. Studies safety hazards & their remedies.	**Equipment & Tools**	Checks availability of tools & equipment. Makes periodic inspections of equipment. Regulates work flow to suit equipment. Helps determine new equipment to buy. Assists on breakdowns whenever possible.
Reports & Records	Prepares activity reports for management. Reviews and acts on inspection reports. Maintains employees' service records. Keeps daily work records and charts.	**Personal Conduct**	Sets a good example for those under him. Assumes responsibility, makes decisions. Supervises with justice and fair play. Shows tact, self control, and respect.

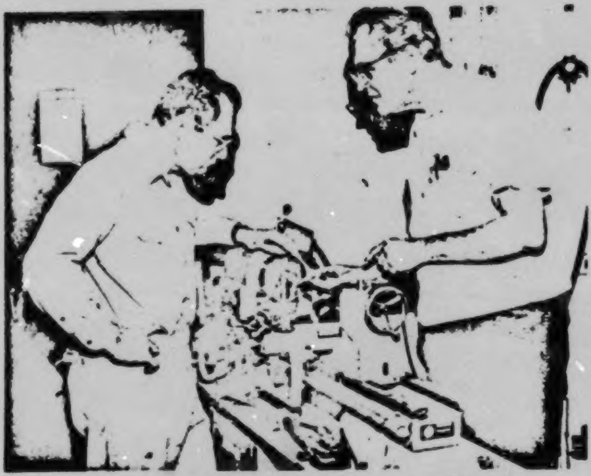


Fig. 2-8. Job training introduces workers to unfamiliar machinery.

library for related information. The workers should attend classes offered by the plant that will help them upgrade their skills and knowledge.

2.50 Several methods of self-education are available to troubleshooters and other maintenance craftsmen who want to better themselves and be promoted. Methods frequently used are classroom instruction, correspondence courses, programed instruction courses, on-the-job training, and the growing field of vendor training.

2.51 Vendor training consists of suppliers of plant machinery providing movies and other educational aids to instruct craftsmen in the proper use and maintenance of their equipment and materials. Lubricant suppliers show movies and slides on good lubrication techniques. Many suppliers have "classrooms on wheels"—vans with instructors and training aids to demonstrate and teach maintenance practices. In addition, some vendors conduct training "schools" at their own plants or offices for the craftsmen who will maintain the equipment.

Use these programed exercises to help check your learning progress.

2-17. Although a troubleshooter may be qualified to do many kinds of work, he should check with his supervisor as to the duties of each ________.	2-17. TRADE REF: 2.39
2-18. Employee handbooks and orientation material state company __________ and work ________.	2-18. POLICIES RULES REF: 2.40
2-19. As a troubleshooter, your closest personal contact with __________ will be the supervisor of the maintenance department.	2-19. MANAGEMENT REF: 2.43
2-20. The maintenance supervisor is responsible for getting work done __________ and on ________.	2-20. SAFELY TIME REF: 2.44
2-21. Whenever you have problems with a job, you should report them to your ____________.	2-21. SUPERVISOR REF: 2.45
2-22. By enrolling in training programs, craftsmen can improve their technical ________.	2-22. SKILLS REF: 2.48
2-23. Training helps workers understand ____________ machinery and teaches them to service and repair it.	2-23. UNFAMILIAR REF: 2.49, Fig. 2-8
2-24. Educational programs and aids provided by manufacturers to teach maintenance practices are called __________ training.	2-24. VENDOR REF: 2.51

SELF-CHECK QUIZ

2-1. Your ability as a troubleshooter depends on your skill in handling which of the following?

a. Parts and components
b. Tools and equipment
c. People
d. All of the above

2-2. Which of the following is most important in qualifying for a higher position in the maintenance department?

a. Management administration
b. Knowledge of automated equipment
c. Skill in working with people
d. Special technical skills

2-3. A person sees himself in which of the following ways?

a. As he feels he is
b. As he wishes he were
c. As he thinks others see him
d. All of the above

2-4. To be a good listener, what must you do first?

a. Give the speaker your attention
b. Process what you see and hear
c. Reveal what you have absorbed
d. Watch for the speaker's gestures

2-5. Which of the following can best help you to communicate effectively with others?

a. Repeat your idea until it sinks in
b. Tell the listener only once
c. Present ideas in related groups
d. Use all the evidence you can to present your point

2-6. The best way to be sure your listener understood what you said is by

a. repeating what you said
b. asking him questions about the subject
c. recognizing his feelings
d. writing the message down

2-7. You can learn to comment on a person's work without annoying him by

a. being tactful
b. ignoring personalities
c. writing your criticisms
d. telling your supervisor first

2-8. The best way to prevent misunderstandings when receiving instructions is to

a. repeat the instructions to yourself silently
b. write the instructions down and say them back in order to make sure you both agree
c. write the instructions down later so you understand them
d. do as you're told without complaining

2-9. Your closest personal contact while troubleshooting a problem is the

a. maintenance department supervisor
b. production line mechanic
c. experienced craftsmen in your group
d. training supervisor or instructor

2-10. To learn how to maintain new equipment, information can be obtained from the manufacturer's representative and the

a. maintenance record cards
b. assembly drawing
c. maintenance manuals
d. parts list

ANSWERS TO SELF-CHECK QUIZ

2-1. d. All of the above. REF: 2.05.

2-2. c. Skill in working with people. REF: 2.06.

2-3. d. All of the above. REF: 2.10.

2-4. a. Give the speaker your attention. REF: 2.16.

2-5. d. Use all the evidence you can to present your point. REF: 2.21.

2-6. b. Asking him questions about the subject. REF: 2.26.

2-7. a. Being tactful. REF: 2.29.

2-8. b. Write the instructions down and say them back in order to make sure you both agree. REF: 2.34.

2-9. a. Maintenance department supervisor. REF: 2.43.

2-10. c. Maintenance manuals. REF: 2.49.

Electrical Emergencies Lesson Plan

The Ohio Trade and Industrial Education Service, Division of Vocational Education of the State Department of Education has prepared an Instructor's Manual entitled Victim Rescue. The manual contains lesson plans on the following 17 topics. The listing of topics is followed by the suggested outline of material to be covered as an instructor teaches trainees on the topic of electrical emergencies.

1. Rescue: Principles-Procedures-Operations Rescue Vehicles, Equipment, Personnel, Safe Driving Practices. 1
2. Rescue Carries and Drags 9
3. Rope: Knots-Bends-Hitches 15
4. Rigging. 23
5. Shoring and Tunneling. 35
6. Forcible Entry 45
7. Vehicle Rescue Operations and the Use of Extrication Tools 53
8. Oxygen-Acetylene Cutting Torches 63
9. Electrical Emergencies 71
10. Waterfront Operations. 77
11. Aerial Ladder and Aerial Tower Rescue Procedures 91
12. Aircraft Crash Rescue. 97
13. Bus Accidents. 101
14. Gas Masks. 105
15. Radiation Hazards. 111
16. Elevator Accidents 119
17. Severe Storms. 125

LESSON PLAN 9
1 to 1½ hours

ELECTRICAL EMERGENCIES

Objectives:

1. The rescuer will explain the dangers when rescue work involves fallen wires and any other electrical wiring.
2. The rescuer will describe the basic principles involved in the transmission of electricity as it relates to open and closed circuits.
3. The rescuer will describe the safest techniques to employ when fallen wires are in contact with an automobile with passengers in it and charged emergency apparatus.
4. The rescuer will explain and demonstrate the safest techniques when handling energized wires. All procedures must follow the instructor's demonstrated performance and safety rules.
5. The rescuer will explain and demonstrate the safest techniques of removing a victim from an electric wire. All procedures must follow the instructor's demonstrated performance and safety rules.
6. The rescuer will explain and demonstrate the proper emergency care to give a victim after rescue from an energized wire.

Teaching Aids: Chalkboard, chalk, eraser, 100 feet section of 1/4" polypropylene rope, two 1/2 pound weights, recently tested pair of lineman's gloves, hot sticks, emergency telephone numbers of local power companies

Reference: "Victim Rescue" text, Chapter 13

STEP I – INTRODUCTION OF LESSON

The rescuer may be required to face situations involving electrical equipment or wiring during certain rescue operations. He should be able to recognize the potential electrical hazards and should know the proper action to take.

Saving property alone never justifies the risk of a man's life. Where life is involved, the urgency is greater and requires prompt action by the rescuer. However, he should think before he acts.

STEP II – PRESENTATION

A. Recognizing the Danger
   1. All wires are potentially dangerous

   2. All fallen wires should be regarded as being energized until proven otherwise

   3. The amount of current or amperage in the wire determines the actual threat to life
      a. Amperage (amps) is the current or flow of electricity
      b. Voltage is the pressure applied to cause the current or amperage to flow

   4. Low voltage (110-120) can cause much damage to a human body (filbrillation), especially if the body is well grounded

   5. Fallen wires may energize the ground for a considerable area
      a. Hazard is much greater during damp or rainy weather

   6. Circuit breakers
      a. Open the circuit when a short or overload exists
      b. Close automatically in a matter of seconds
      c. If short still exists, circuit breakers open again
      d. This can cause a downed wire to whip with each electrical surge

7. Invisible danger
   - a. Downed wires on automobiles or the ground may show no evidence of being energized
   - b. Wires laying across a wire fence can energize the fence for a considerable distance
   - c. Repeat - that all downed wires present potential hazards and danger

B. Acting in an Emergency

1. Stay clear of all fallen wires and call the power company

Give local compani
phone number

2. If a victim is involved, waiting for the power company may mean the difference between life and death

3. A reasonable working knowledge of the potential electrical hazards is a must for all emergency medical technicians

4. If wires are down on arrival, emergency personnel can generally proceed as follows:
   - a. Radio for the power company
   - b. Move the crowd back at least one span each way from the broken or sagging wires
     - 1) The span of wires adjacent to the trouble may be weakened
     - 2) Any movement may burn other wires down
     - 3) Wires on the ground may burn through, curl up, or roll along the ground
     - 4) Flashes may occur causing eye injuries, etc.

5. Emergencies involving vehicles
   - a. Rubber tires insulate the vehicle from the ground
   - b. No flow of current from vehicle to the ground
   - c. Passengers will be relatively safe if they remain in the vehicle
   - d. A person touching the vehicle while in contact with the ground will complete the circuit; this may prove fatal

e. If victim insists on leaving vehicle, the rescuer must instruct him how to jump out
    1) Make certain hands or feet do not touch car when coming in contact with the ground
f. Relate example of women leaving energized car, etc.

Discuss and demonstrate this procedure

6. Charged emergency apparatus
    a. Aerial ladders may come in contact with overhead wires
    b. Wires may fall across vehicle
    c. Contact must not be made with apparatus and ground
    d. If necessary to leave the vehicle, jump off, do not step off
    e. Hands, feet, and body must clear vehicle before contact is made with the ground
    f. When on the ground, be sure you do not touch the vehicle again

C. Handling Energized Wires
    1. Polypropylene rope thrown from a reasonable distance over high voltage wires is relatively safe

    2. Using wet rope may prove fatal

    3. Polypropylene rope is completely non-conductive
        a. It will not absorb moisture
        b. Used by all power companies

    4. Rope-and-weight tool
        a. Consists of 100' of 1/4" rope with 1/2 pound weights attached to each end
        b. This tool can be used to gain control of a fallen wire
        c. Must be used with approved gloves and hot stick

Fig. 1 – p. 163

5. Using the rope-and-weight tool
    a. Clear all persons from the area
    b. Put on lineman's gloves and protectors
    c. Stand opposite the point from which you will move the wire and approximately 30' from the wire
    d. Throw one end of weighted rope under the wire
    e. Throw the other end over the wire
        1) Making sure that it lands near the first weight thrown
    f. Pick up the two weighted ends with the hot stick
        1) Drag wire clear
        2) Be sure wire is guarded
    g. Keep in mind that the ground may be energized for some distance around the fallen wire

Demonstrate

6. Hot Sticks
    a. Specially designed tool to handle energized wires
    b. Specially treated to prevent moisture penetration
    c. Made of wood or fiberglass
    d. Store in dry compartment
    e. Should be inspected at regular intervals by competent individual or concern

7. Removing Victim from Wire
    a. Victim may be lying on an energized wire
    b. Quick method is to push or pull the victim from the wire using a hot stick
    c. Rescuer to stay as far away from victim as hot stick will permit
    d. If additional hot stick is available, one man can hold wire while the other removes victim
        1) Prevents wire from whipping when free of victim
        2) Keeps wire grounded and prevents additional shock and burns to victim

e. Procedure when hot sticks are not available

Demonstrate

  1) Use polypropylene rope as previously mentioned
  2) Loop rope around some part of victim's body (leg, arm), and drag victim free
  3) Rescuer to take all precautions to prevent his body or clothing from making contact with victim or wire
  4) Order all bystanders away from danger area

D. Emergency Care After Rescue
  1. Victim may require any or all of the following
    a. Resuscitation and closed chest heart compression
    b. Care for shock
    c. Care for burns
    d. Care for lacerations
    e. Care for fractures

E. Refer Learners to Pages 166-167 in text

STEP III – APPLICATION

A. Demonstrate and have learners carry out the following
  1. Proper way to leave energized car

  2. Proper way to jump off energized vehicle

  3. How to loop victim with polypropylene rope for removal from "hot wires"

  4. How to use rope tool

STEP IV – CHECKING AND FOLLOW-UP

1. Question and answer period

2. Reteach any portion of lesson not understood

Plant Safety and Good Housekeeping Lesson Plan

Operation of Wastewater Treatment Plants, (Second Edition, 1980) is a three-volume, 1950-page, field study training program. The material can be used by individuals in home study programs or as a textbook by instructors responsible for instruction in some aspect of wastewater treatment. The following pages cited from Volumes I and II illustrate the thoroughness with which the instructional material was planned, prepared, and how the trainee and/or instructor can use it.

OPERATION OF WASTEWATER TREATMENT PLANTS

Second Edition

VOLUME I

A Field Study Training Program

prepared by

California State University, Sacramento
(formerly Sacramento State College)
Department of Civil Engineering

in cooperation with the
California Water Pollution Control Association

****

Kenneth D. Kerri, Project Director
Bill B. Dendy, Co-Director
John Brady, Consultant and Co-Director
William Crooks, Consultant

****

for the

Environmental Protection Agency
Office of Water Program Operations
Municipal Permits and Operations Division

First Edition, Technical Training Grant No. 5TT1-WP-16-03 (1970)
Second Edition, Grant No. T900690010

1980

USES OF THIS MANUAL

Originally this manual was developed to serve as a home-study course for operators in remote areas or persons unable to attend formal classes either due to shift work, personal reasons or the unavailability of suitable classes. This home-study training program used the concepts of self-paced instruction where you are your own instructor and work at your own speed. In order to certify that a person had successfully completed this program, an objective test was included at the end of each chapter and the training course became a correspondence or self-study type of program.

Once operators started using this manual for home study, they realized that it could serve effectively as a textbook in the classroom. Many colleges and universities have used the manual as a text in formal classes often taught by operators. In areas were colleges were not available or were unable to offer classes in the operation of wastewater treatment plants, operators and utility agencies joined togehter to offer their own courses using the manual.

Occasionally a utility agency has enrolled from three to over 300 of its operators in this training program. A manual is purchased for each operator. A senior operator or a group of operators are designated as instructors. These operators help answer questions when the persons in the training program have questions or need assistance. The instructors grade the objective tests at the end of each chapter, record scores and notify California State University, Sacramento, of the scores when a person successfully completes this program. This approach avoids the long wait while papers are being graded and returned by CSUS.

This manual was prepared to help operators run their treatment plants. Please feel free to use it in the manner which best fits your training needs and the needs of other operators. We will be happy to work with you to assist you in developing your training program. Please feel free to contact

Ken Kerri, Project Director
Operation of Wastewater Treatment Plants
California State University, Sacramento
6000 Jay Street
Sacramento, California 95819

Phone (916) 454-6142
or 454-6366

INSTRUCTIONS TO PARTICIPANTS IN HOME-STUDY COURSE

Procedures for reading the lessons and answering the questions are contained in this section.

To progress steadily through this program, you should establish a regular study schedule. For example, many operators in the past have set aside two hours during two evenings a week for study.

The study material is contained in three volumes divided into 29 chapters. Some chapters are longer and more difficult than others. For this reason, many of the chapters are divided into two or more lessons. The time required to complete a lesson will depend on your background and experience. Some people might require an hour to complete a lesson and some might require three hours; but that is perfectly all right. *THE IMPORTANT THING IS THAT YOU UNDERSTAND THE MATERIAL IN THE LESSON!*

Each lesson is arranged for you to read a short section, write the answers to the questions at the end of the section, check your answers against suggested answers; and then *YOU* decide if you understand the material sufficiently to continue or whether you should read the section again. You will find that this procedure is slower than reading a normal textbook, but you will remember much more when you have finished the lesson.

At the end of each chapter, you will find an "objective test." Mark your answers on the special answer sheet provided for each chapter. Some discussion and review questions are provided following each lesson in the later chapters. These questions review the important points you have covered in the lesson.

The objective test at the end of each lesson contains true or false, multiple-choice, fill-in-the-blank, or match-the-answers types of questions. The purposes of this exam are to review the chapter and to give experience in taking different types of exams. *MAIL TO THE PROGRAM DIRECTOR ONLY YOUR ANSWERS TO OBJECTIVE TESTS ON THE PROVIDED ANSWER SHEETS.*

After you have completed the last objective test, you will find a final examination. This exam is provided for you to review how well you remembered the material. You may wish to review the entire manual before you take the final exam. Some of the questions are essay-type questions which are used by some states for higher-level certification examinations. After you have completed the final examination, grade your own paper and determine the areas in which you might need additional review before your next examination.

You are your own teacher in this program. You could merely look up the suggested answers from the answer sheet or copy them from someone else, but you would not understand the material. Consequently, you would not be able to apply the material to the operation of your plant nor recall it during an examination for certification or a civil service position.

YOU WILL GET OUT OF THIS PROGRAM WHAT YOU PUT INTO IT.

COURSE OUTLINE

VOLUME I, SECOND EDITION

Chapter	Topic	Page
1	The Treatment Plant Operator	1
2	Why Treat Wastes?	11
3	Wastewater Treatment Facilities	25
4	Racks, Screens, Comminutors and Grit Removal	55
5	Sedimentation and Flotation	101
6	Trickling Filters	155
7	Rotating Biological Contactors	197
8	Activated Sludge (Package Plants and Oxidation Ditches)	227
9	Waste Treatment Ponds	275
10	Disinfection and Chlorination	319
	Final Examination	397
	Glossary	405
	Index	435

TECHNICAL CONSULTANTS, FIRST EDITION

William Garber
George Gardner
Carl Nagel
Joe Nagano
Frank Phillips
Warren Prentice
Ralph Stowell
Larry Trumbull

TECHNICAL CONSULTANTS, SECOND EDITION

George Gardner
Larry Hannah
Mike Mulbarger
Carl Nagel
Al Petrasek

COURSE OUTLINE

VOLUME II, SECOND EDITION

Chapter	Topic
11	Activated Sludge (Conventional Activated Sludge Plants)
12	Sludge Digestion and Solids Handling
13	Effluent Disposal
14	Plant Safety and Good Housekeeping
15	Maintenance
16	Laboratory Procedures and Chemistry
17	Basic Arithmetic and Treatment Plant Problems
18	Analysis and Presentation of Data
19	Records and Report Writing
	Final Examination
	Glossary
	Index

VOLUME III, SECOND EDITION

20	Odor Control
21	Activated Sludge (Pure Oxygen and Operational Control Alternatives)
22	Solids Handling and Disposal
23	Solids Removal from Secondary Effluents
24	Phosphorus Removal
25	Wastewater Reclamation
26	Instrumentation
27	Industrial Waste Monitoring
28	Industrial Waste Treatment
29	Support Systems
	Final Examination
	Glossary
	Index

CHAPTER 14. PLANT SAFETY AND GOOD HOUSEKEEPING

(Lesson 3 of 3 Lessons)

14.3 SAFETY IN THE LABORATORY[9]

In addition to all safety practices and procedures mentioned in the previous sections of this chapter, the collecting of samples and the performance of laboratory tests require that you be aware of the specific hazards involved in this type of work.

Laboratories use many hazardous chemicals. These chemicals should be kept in limited amounts and used with respect. Your chemical supplier may be able to supply you with a safety manual.

14.30 Sampling Techniques

Whenever possible, rubber gloves should be worn when your hands may come in direct contact with wastewater or sludge. When you have finished sampling, always wash the gloves thoroughly before removing them. After removing the gloves, wash your hands thoroughly, using a disinfectant-type soap.

NEVER COLLECT ANY SAMPLES WITH YOUR BARE HANDS IF YOU HAVE ANY BROKEN SKIN AREAS SUCH AS CUTS OR SCRATCHES.

Do not climb over or go beyond guardrails or chains when collecting samples. Use sample poles, ropes and other devices as necessary to collect samples.

14.31 Equipment Use and Testing Procedures

The following are some basic procedures to keep in mind when working in the laboratory.

NEVER LOOK INTO THE OPEN END OF A CONTAINER DURING A REACTION OR WHEN HEATING THE CONTAINER.

1. Use proper safety goggles or face shield in all tests where there is danger to the eyes.
2. Use care in making rubber-to-glass connections. Lengths of glass tubing should be supported while they are being inserted into rubber. The ends of the glass should be *FLAME POLISHED*[10] to smooth them out, and a lubricant such as water should be used. Never use grease or oil. Gloves or some other form of protection for the hands should be used when making such connections. The tubing should be held as close to the end being inserted as possible to prevent bending or breaking. Never try to force rubber tubing or stoppers from glassware. Cut the rubber as necessary to remove it.
3. Always check labels on bottles to make sure that the proper chemical is selected. Never permit unlabeled or undated containers to accumulate around or in the laboratory. Keep storage areas well organized to prevent mistakes when selecting chemicals for use. Clean out old or excess chemicals. Separate flammable, explosive, or special hazard items for storage in an approved manner. See Section 14.9, "Additional Reading," Reference 10.

ALL CHEMICAL CONTAINERS SHOULD BE CLEARLY LABELED, INDICATING CONTENTS AND DATE BOTTLE WAS OPENED OR SOLUTION PREPARED. ALL POISONS MUST BE LABELED WITH "SKULL AND CROSSBONES" AND ANTIDOTE.

---

[9] *Also see* FISHER SAFETY MANUAL, *Fisher Scientific Company, 711 Forbes Avenue, Pittsburg, PA 15219. Price $6.00.*

[10] *Flame Polished. Melted by a flame to smooth out irregularities. Sharp or broken edges of glass (such as the end of a glass tube) are rotated in a flame until the edge melts slightly and becomes smooth.*

4. Never handle chemicals with your bare hands. Use a spoon or spatula for this purpose.
5. Be sure that your laboratory is adequately ventilated.

ALWAYS WORK IN A FUME HOOD IF WORKING WITH CHEMICALS OR SAMPLES HAVING TOXIC FUMES.

Even mild concentrations of fumes or gases can be dangerous.

6. Never use laboratory glassware for a coffee cup or food dish. This is particularly dangerous when dealing with wastewaters.
7. When handling hot equipment of any kind, always use tongs, asbestos gloves, or other suitable tools. Burns can be painful and can cause more problems (encourage spills, fire, and shock).
8. When working in the lab, avoid smoking and eating except at prescribed coffee breaks or at the lunch period.

ALWAYS THOROUGHLY WASH YOUR HANDS BEFORE SMOKING OR EATING.

9. Do not pipet chemicals or wastewater samples by mouth. Always use a suction bulb or an automatic burette.
10. Handle all chemicals and reagents with care. Read and become familiar with all precautions or warnings on labels. Know and have available the antidote for all poisonous chemicals in your lab.
11. A short section of rubber tube on each water outlet is an excellent water flusher to wash away harmful chemicals from the eyes and skin. It is easy to reach and can quickly be directed on the exposed area. Eyes and skin can be saved if dangerous materials are washed away quickly.

12. Dispose of all broken or cracked glassware immediately. Chipped glassware may still be used if it is possible to fire polish the chip in order to eliminate the sharp edges. This may be done by slowly heating the chipped area until it reaches a temperature at which the glass will begin to melt. At this point remove from flame and allow to cool.

NEVER HOLD ANY PIECE OF GLASSWARE OR EQUIPMENT IN YOUR BARE HANDS WHILE HEATING.

Always use a suitable glove or tool.

13.

REMEMBER TO ADD ACID TO WATER, BUT **NEVER** THE REVERSE.

14. Wear a protective smock or apron when working in the lab. This may save you the cost of replacing your work clothes or uniform. Protective eye shields should be worn too.
15. Electrical equipment should be properly grounded and safeguards provided to prevent insertion of improper plugs into the equipment.
16. Don't keep your lunch in a refrigerator that is used for samples or chemical storage.

QUESTIONS

Write your answers in a notebook and then compare your answers with those on page 235.

14.3A What safety precautions would you take when collecting laboratory samples from a plant influent?

14.3B Why should you always wash your hands before eating?

14.3C Why should chemicals and reagents be handled with care?

14.4 FIRE PREVENTION

Fires are a serious threat to the health and safety of the operator and to the buildings and equipment in a treatment plant. Fires may injure or cause the death of an operator. Equipment damaged by fire may no longer function properly, and your treatment plant may have difficulty adequately treating the influent wastewater.

Good safety practices with respect to fire prevention require a knowledge of:

1. Ingredients necessary for a fire
2. Fire control methods
3. Fire prevention practices

14.40 Ingredients Necessary for a Fire

The three essential ingredients of all ordinary fires are:

1. FUEL — paper, wood, oil, solvents, and gas.
2. HEAT — the degree necessary to vaporize fuel according to its nature.
3. OXYGEN — normally at least 15 percent of oxygen in the air is necessary to sustain a fire. The greater the concentration, the brighter the blaze and more rapid the combustion.

14.41 Fire Control Methods

To extinguish a fire, it is necessary to remove only one of the essentials by:

1. Cooling (temperature and heat control)
2. Smothering (oxygen control)
3. Isolation (fuel control)

Fires are classed as A-, B-, C-, or D-type fires, according to what is burning.

Class A fires (general combustibles such as wood, cloth, paper, or rubbish) are usually controlled by cooling — as by use of water to cool the material.

Class B fires (flammable liquids such as gasoline, oil, grease, or paint) are usually smothered by oxygen control — as by use of foam, carbon dioxide, or a dry chemical.

Class C fires (electrical equipment) are usually smothered by oxygen control — use of carbon dioxide or dry-chemical extinguishers — nonconductors of electricity.

Class D fires occur in combustible metals, such as magnesium, lithium, or sodium, and require special extinguishers and techniques.

Use carbon dioxide compressed gas extinguishers to control fires around electrical contacts. Do not use soda-acid type extinguishers because the electrical motor will have to be rewound and you could be electrocuted attempting to put out the fire.

Know where fire extinguishers and hoses are kept and know where yard hydrants are located, what each is for, and how to use them.

14.42 Fire Prevention Practices

You can prevent fires by:

1. Maintaining a neat and clean work area, preventing accumulation of rubbish.
2. Putting oil- and paint-soaked rags in covered metal containers.
3. Observing all "no smoking" signs.
4. Keeping fire doors, exits, stairs, fire lanes, and firefighting equipment clear of obstructions.
5. Keeping all burnable materials away from furnaces or other sources of ignition.
6. Reporting any fire hazards you see that are beyond your control, especially electrical hazards which are the source of many fires.

Finally, here again are the things to remember:

1. Prevent fire by good housekeeping and proper handling of flammables.
2. Make sure that everyone obeys "no smoking" signs in all areas near explosive or flammable gases.
3. In case of fire, turn in the alarm immediately and make sure that the fire department is properly directed to the place of the fire.
4. Action during the first few seconds of ignition generally means the difference between destruction and control. Use the available portable fire-fighting equipment to control the fire until help arrives.
5. Use the proper extinguisher for that fire.
6. Learn how to operate the extinguishers.

If it is necessary to get out of the building, do not stop to get anything — just get out!

Can you prevent fires? You can if you try, so let's see what we can do to preserve our well-being and the water pollution control system.

If you guard against fires, you will be protecting your lives and your community.

14.43 Acknowledgment

Material in this section on Fire Prevention appeared in the July 1970 issue of the Journal of the Water Pollution Control Federation, on pages 1426 and 1427, as a Wastewater Wisdom talk. Originally, the information appeared as a National Safety Council "5 Minute Safety Talk," published in the *INDUSTRIAL SUPERVISOR*.

QUESTIONS

Write your answers in a notebook and then compare your answers with those on page 235.

14.4A What are the necessary ingredients of a fire?

14.4B How should oil- and paint-soaked rags be handled?

14.5 WATER SUPPLIES

Inspect your plant to see if there are any cross-connections between your potable (drinking) water and items such as water seals on pumps, feed water to boilers, hose bibs below grade where they may be subject to flooding with wastewater or sludges, or any other location where wastewater could contaminate a domestic water supply.

If any of these or other existing or potential cross-connections are found, be certain that your drinking water supply source is properly protected by the installation of an approved back-flow prevention device. Many treatment plants use an *AIR-GAP DEVICE*[11] (Figure 14.5) to protect their drinking water supply.

It is a good practice to have your drinking water tested at least monthly for coliform group organisms. Sometimes the best of back-flow prevention devices do fail.

Never drink from outside water connections such as sill cocks and hoses. The hose you drink from may have been used to carry effluent or sludge.

You may find in your plant that it will be more economical to use bottled drinking water. If so, be sure to tack up conspicuous signs that your water is not drinkable. This also applies to all hose bibs in the plant from which you may obtain water other than a potable source. This is a must in order to inform visitors or absent-minded or thirsty employees that the water from each marked location is not for drinking purposes.

---

[11] *Air-gap Device. An open vertical drop, or vertical empty space, between a drinking (potable) water supply and the point of use in a wastewater treatment plant. This gap prevents back siphonage because there is no way wastewater can reach the drinking water supply.*

AIR GAP

AN OPEN VERTICAL DROP, OR VERTICAL EMPTY SPACE, BETWEEN A DRINKING (POTABLE) WATER SUPPLY AND THE POINT OF USE IN A WASTEWATER TREATMENT PLANT. THIS GAP PREVENTS BACK SIPHONAGE BECAUSE THERE IS NO WAY WASTEWATER CAN REACH THE DRINKING WATER SUPPLY.

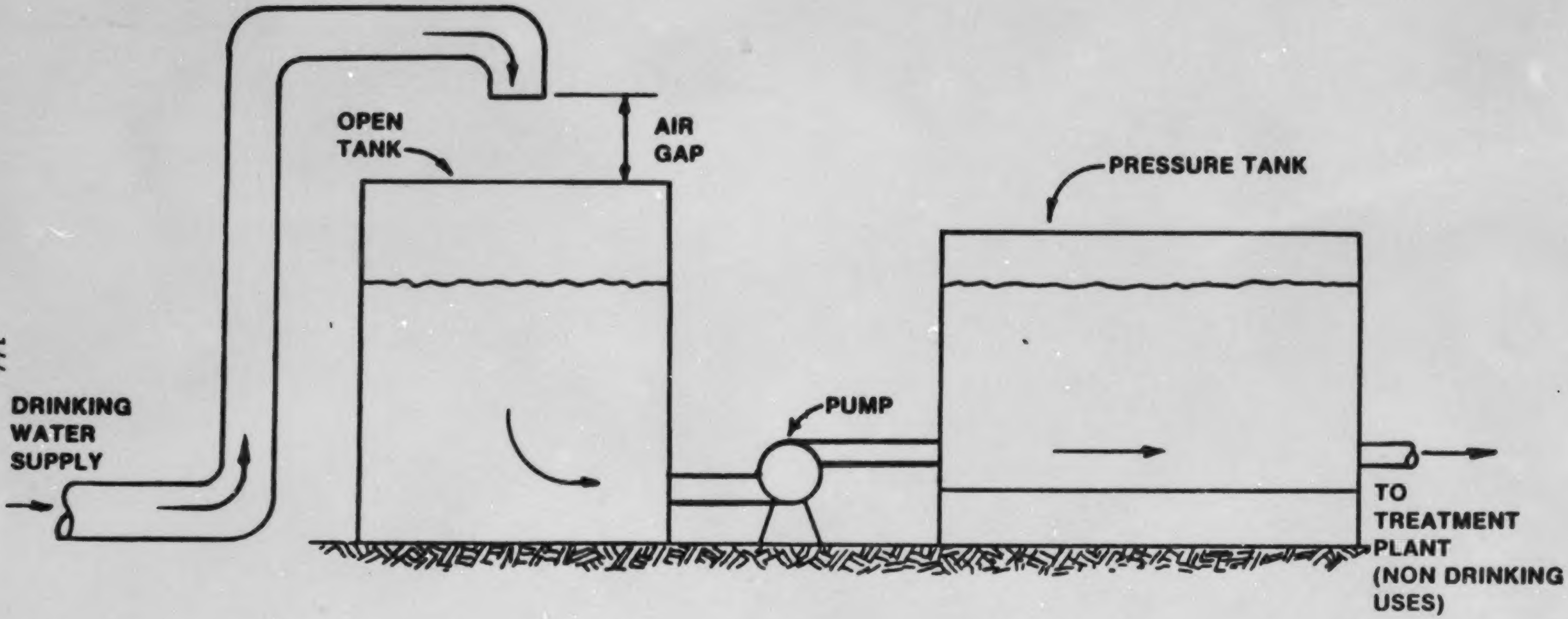

DRINKING WATER SUPPLY
OPEN TANK
AIR GAP
PRESSURE TANK
PUMP
TO TREATMENT PLANT (NON DRINKING USES)

Fig. 14.5 Air-gap device

DO NOT DRINK!

QUESTION

Write your answer in a notebook and then compare your answer with the one on page 235.

14.5A Why do some wastewater treatment plants use bottled water for drinking purposes?

14.6 SAFETY EQUIPMENT AND INFORMATION

Post conspicuously on your bulletin board the location and types of safety equipment available at your plant (such as first aid kit, breathing apparatus and explosiometers). You, as the plant operator, should be thoroughly familiar with the operation and maintenance of each piece of equipment. You should review these at fixed intervals to be certain that you can safely use the piece of equipment as well as to be sure that it is in good operating condition.

Contacts should be made with your local fire and police departments to acquaint them with hazards at your plant as well as to inform them of the safety equipment that is necessary to cope with problems that may arise. Arrange a joint training session with these people in the use of safety equipment and the handling of emergencies. They also should know access routes to and around the treatment plant.

If you have any specific problems of a safety nature, do not hesitate to contact officials in your state safety agency. They can be of great assistance to you. And do not forget your equipment manufacturers; their familiarity with your equipment will be of great value to you.

Also posted in conspicuous places in your plant should be such information as the phone numbers of your fire and police departments, ambulance service, chlorine supplier or repairman, and the nearest doctor who has agreed to be available on call. Having these immediately available at telephone sites may save your or a fellow worker's life. Check and make sure these numbers are listed at your plant. If they are not listed, *ADD THEM NOW.*

Prepare an emergency medical information sheet for each operator. Keep all of these sheets together in one binder. Send the binder with the ambulance that takes an injured operator to the hospital.

QUESTION

Write your answer in a notebook and then compare your answer with the one on page 235.

14.6A What emergency phone numbers should be listed in a conspicuous place in your plant?

14.7 "TAILGATE" SAFETY MEETINGS[12]

Safety is crucial. Accidents cost money. No one can afford to lose time from their job due to injury. Safety meetings provide the opportunity to explain and discuss safe procedures and safe conditions.

In some states, by law, you may be required to conduct safety meetings at fixed intervals with employees. Whether this is required or not, it certainly is a good practice. Invite police and fire personnel to participate from time to time so you get to know them and they become acquainted with you and your facilities. Once every 7 to 10 days is a good frequency. These meetings should usually be confined to one topic, and should be no longer than 10 to 20 minutes. It will be worthwhile to review monthly any accidents during the past month at one of the meetings. Do not use this meeting to fix blame. Try to dig into the cause and to determine what can be or has been done to prevent a similar accident in the future.

To help you conduct "tailgate" safety meetings, this chapter was arranged to discuss the safety aspects of different plant operations. The material in some sections was deliberately repeated to cover the topic and to remind you of dangers. Some plants select topics for their "tailgate" safety meetings from a "safety goof box." The box is placed in a convenient location. Whenever anyone sees an unsafe situation or sees someone perform a hazardous act without proper safety precautions, this person places a note in the box identifying the situation or person and the act. The box is opened at each safety meeting, and the cause of the "goof" and the steps that can be taken to correct and prevent it from happening again are discussed.

Your state safety agency, your insurance company, equipment and material suppliers, and the Water Pollution Control Federation are all excellent sources of literature and aids that may help you in conducting "tailgate" safety meetings. Some of these agencies may be able to supply you with posters, signs, and slogans that are very effective safety reminders.[13] You may wish to dream up some reminders of your own.

SAFETY FIRST!

QUESTIONS

Write your answers in a notebook and then compare your answers with those on page 235.

14.7A What is the purpose of "tailgate" safety meetings?

14.7B How frequently should safety meetings be held for treatment plant operators?

14.8 HOW TO DEVELOP SAFETY TRAINING PROGRAMS

14.80 Conditions for an Effective Safety Program

Effective safety programs rely on many techniques to help workers recognize hazards and learn safe procedures. These safety programs can include highly organized meetings to tailgate safety sessions to informal get togethers or bull sessions. Safety programs of all types have proven very effective when the following conditions are met:

---

[12] *"Tailgate." The term "tailgate" comes from safety meetings regularly held by the construction industry around the tailgate of a truck.*

[13] *Chemical Laboratory Safety Posters have been prepared by the Manufacturing Chemists Association, 1825 Connecticut Avenue, N.W., Washington, D.C. 20009. Price $3.50 per set of 12 posters.*

1. Basic safety concepts and practices are thoroughly understood by all.
2. *EVERYONE PARTICIPATES* and accepts personal responsibility for their own safety and that of their fellow workers (participation at all levels is absolutely essential to the continued success of any safety program).
3. Adequate safety equipment is available and its capabilities thoroughly understood. Crews must regularly review and drill in the actual use of the equipment under emergency and hazardous conditions.
4. Everyone realizes that safety is a continuing learning and re-learning process — a way of life that must become part of your regular habits.
5. *ACCIDENTS* are studied step by step and thoroughly reviewed with the attitude that "they are caused and don't just happen." Every reasonable step will be taken to reduce the chance of an accident happening again to as near zero as is practical.
6. Every detail of work is a subject for discussion to the extent it will improve safety.
7. Workers realize they should stop anyone performing an unsafe act and remind the person that they are not following safe procedures, why, and how the job can be done safely.
8. Ability. Before starting a job, assure yourself you can do the job without injury. If you are assigned work you are not qualified to perform, call this problem to the attention of your supervisor.
9. Understanding. Before starting a job, thoroughly understand the work to be done, your job and the safety rules that apply. Tailgate safety sessions or pre-job discussions will help promote safe operations.
10. Management actively supports the safety training program and demands that safe equipment and procedures be used at all times.

14.81 Start at the Top

An effective safety training program must start at the top. The Chief Executive, who controls the purse strings and makes final decisions, must not only support safety but must promote it from the start and continuously promote safety on a day-to-day basis. The safety director must have a top management position or have direct access to the Chief Executive. Without this type of organization, a safety program may be put off, watered down or even eliminated in the name of urgency, time and cost.

14.82 Plan for Emergencies

Start where you are. Nothing is going to stop while you get your safety program organized. Emergencies, accidents and injuries can happen at any time and usually at the wrong time. Try to minimize the impact of accidents while trying to develop or improve your plan for prevention. The first step is to prepare emergency procedures for your treatment plants, collection systems and vehicles. These plans should include:

1. What to do and what not to do for the injured,
2. How to contact the nearest fire department, rescue squad or ambulance,
3. Identification of the injured and notification of relatives,
4. Direction for rescue vehicles to reach the scene and to locate the victim,
5. Prevention of further damage to people and property, and
6. Names of persons and authorities to be notified after the emergency.

All employees must be interested in these procedures and copies should be posted in prominent places in all plant areas, pumping stations, and vehicles. The fact that employees are preparing for emergencies will have a positive effect in reducing accidents.

14.83 Promote Safety

Start early with your promotion of safety. Make safety a part of discussions and work procedures. Follow safe practices yourself — this applies especially to supervisory personnel. Example is a powerful incentive.

14.84 Hold Safety Drills and Training Courses

Remember those fire drills in school? Try drilling on how employees should respond during emergencies, including evacuation of facilities. All facilities should have the necessary fire extinguishers, gas masks and self-contained breathing apparatus. Do not wait for an emergency before trying to learn how to use this equipment. Get proper instructions and conduct practice sessions.

First aid and chlorine safety are important steps in organizing others to assist in your safety program. You can use the Red Cross multi-media program to train first aid teams and instructors. Chlorine manufacturers or distributors provide excellent instruction in chlorine hazards and safety precautions.

When developing your training courses, try to emphasize the most hazardous tasks where accidents are likely to happen. Studies have shown that injuries most often occur when doing activities that are not routine. In your course discussions try to identify how hazards can cause injuries, how bad the injuries can be, and ways to avoid injury.

14.85 Purchase the Obvious Safety Equipment First

Hard hats, safety shoes, and eye protection apply to all personnel in designated areas and/or specific jobs. Purchase this equipment and post the areas where it must be used. The purchase of more specific and expensive equipment such as gas analyzers, explosion meters, and audio meters, are more critical and costly. The need and time to purchase them will be obvious as your safety program progresses.

14.86 Safety Is Important for Everyone

As your safety program develops, you will realize that safety is the responsibility of everyone, from supervisors to workers. Everyone must be involved. Organize safety committees and meetings from top to bottom, as well as from bottom to top. If we do it well, then safety practices will progress from top to bottom. Ideas and suggestions will come if they are recognized and implemented.

14.87 Necessary Paper Work

When you start to develop your safety program, concentrate your efforts on programs that apply generally to all employees. Paper work can be helpful to identify the causes of accidents and to develop corrective procedures.

1. Accident report forms (Figure 14.6). Use these forms to analyze the causes of accidents and to prevent future accidents.
2. Safety policy. The Chief Executive must establish a safety policy and repeatedly state support of the policy.

150

3. Safety rules. Safety rules are as important as work rules and they should be implemented and enforced in the same manner. Most people perform better and with more confidence if they know the rules of the game. These rules must apply to everyone. Supervisors should serve as examples to the workers.
4. Supervisor's guides. Supervisors must have guidelines on how to promote and implement a safety program and enforce the rules.
5. Review of plans and specifications and also plant inspections. State and OSHA Regulations must be used when reviewing plans and specifications. Checklists are a tremendous aid during plant inspections.

14.88 Train for Safety

Training is essential. Use every opportunity to give safety instruction from ten-minute on-the-spot chats to supervisory safety meetings. Vary the techniques and timing with chats, meetings, drills, exercises, workshops and seminars. Cover all the subjects. Matching discussions to incidents such as slips and falls during the slippery season, defensive driving if a bad accident has occurred in the area, and chlorine safety if there have been problems with leaks. Get your subject material out while you have their attention.

14.89 Safety Summary

All types of safety programs are helpful. If variety is the spice of life, let variety add spice to your safety program. Informal chats on safety do not replace formal safety meetings or vice versa. Every type of safety meeting can help you develop a very effective safety program.

Your safety program should include the following items:

1. Get your top official to support and promote safety,
2. Give your safety officer direct access to the Chief Executive,
3. Direct your program general topics to the more specific,
4. Organize from top to bottom,
5. Establish rules and implement and enforce them,
6. Train at all levels from employment to retirement, and
7. *MAKE SAFETY A HABIT.*

This section was prepared from material in:

1. "A Practical Approach to a Safety Program," by Richard R. Metcalf, Deeds & Data, Water Pollution Control Federation, Washington, D.C., July, 1977, and
2. "Safety for the Collection System Worker," by Glenn Davis in *OPERATION AND MAINTENANCE OF WASTEWATER COLLECTION SYSTEMS* for the U.S. Environmental Protection Agency by California State University, Sacramento, Sacramento, California, 1976.

QUESTIONS

Write your answers in a notebook and then compare your answers with those on page 235.

14.8A List three types of safety meetings.

14.8B What is the role of management in a safety training program?

14.8C Why should safety drills be held regularly?

14.8D What types of paper work are necessary for an effective safety training program?

CITY OF ______ WASTEWATER TREATMENT
PLANT ACCIDENT REPORT

Date of this report ____ Name of person injured ______

Date of injury ____ Time ____ a.m. p.m. Occupation ______

Home address ______________ Age ___ Sex ___

Check ___First aid case, or ___disabling (lost time) injury

___Employee or staff injury, ___on duty, or ___off duty

___Visitor injury

Date last worked ______ Date returned to work ______

Person reporting ______________

DESCRIPTION OF ACCIDENT

1. Description of Accident ______________
(Describe in detail what happened) (Name machine, tool, appliance, ______________
gas or liquid involved — if machine or vehicle — name part, gears, pulley, etc.)
2. Accident occurred where? ______________
If vehicle accident,
make simple sketch of
scene of accident.
3. Describe nature of injury and part of body affected ______
____
(Amputation of finger, laceration of leg, back strain, etc.)
4. Were other persons involved? ______________
(If yes, give names and addresses.)
____
5. Names and addresses of witnesses ______________
____
6. If property damage involved, give brief description ______
____
7. If hospitalized, name of hospital ______________
8. Name and address of physician ______________
9. Treatment given for injuries ______________
____

Fig. 14.6 Typical accident report form

14.9 SUMMARY

Following is a summary of the safety precautions that have been discussed in the previous sections.

1. Good design without proper safety precautions will not prevent accidents. *ALL PERSONNEL MUST BE INVOLVED IN A SAFETY PROGRAM AND PROVIDED WITH FREQUENT SAFETY REMINDERS.*
2. Never attempt to do a job unless you have sufficient help, adequate skills, the proper tools, and necessary safety equipment.
3. Never use fingers to remove a manhole cover or heavy grate. Use the proper tool.

4. "Lift with your legs, not your back" to prevent back strains.

5. Use ladders of any kind with caution. Be certain that portable ladders are positioned so they will not slip or twist. Whenever possible, tie the top of a ladder used to enter below-grade structures. Do not use metal ladders near electrical boards or appliances.

6. Never enter a manhole, pit, sump, or below-grade enclosed area when by yourself and without adequate ventilation.

7. Always test manholes, pits, sumps, and below-grade enclosed areas for explosive atmosphere, oxygen deficiency, and hydrogen sulfide. Before entering, thoroughly ventilate with forced air blower.

8. Wear or use safety devices such as safety harnesses, gas detectors, and rubber gloves to prevent infections and injuries.

9. Never use a tool or piece of equipment unless you are thoroughly familiar with its use or operation and know its limitations.

10. When working in traffic areas, always provide:
    a. Adequate advance warning to traffic by signs and flags.
    b. Traffic cones, barricades, or other approved items for channeling the flow of traffic around your work area.
    c. Protection to workers by placing your vehicle between traffic and job area, and/or by use of flashing or revolving lights, or other devices.
    d. Flagmen when necessary to direct and control flow of traffic.

11. Before starting a job, be certain that work area is of adequate size. If not, make allowances for this. Keep all working surfaces free of material that may cause surface to be slippery.

12. See to it that all guardrails and chains are properly installed and maintained.

13. Provide and maintain guards on all chains, sprockets, gears, shafts, and other similar moving pieces of equipment that are normally accessible.

14. Before working on mechanical or electrical equipment, properly turn off and/or tag breakers to prevent the accidental starting of the equipment while you are working on it. Wear rubber gloves and boots wherever you may contact "live" electrical circuits.

15. Never enter a launder, channel, conduit, or other slippery area when by yourself.

16. Do not allow smoking or open flames in the area of, on top of, or in any structure in your digestion system. Post all these areas with warning signs in conspicuous places.

17. Never enter a chlorine atmosphere by yourself or without proper protective equipment. Seek the cooperation of your local fire department in supplying self-contained breathing apparatus.

18. Obtain and post in a conspicuous location the name and telephone number of the nearest chlorine emergency service. Acquaint your police and fire department with this service.

19. Inspect all chlorine connectors and lines before using. Discard any of these that appear defective.

20. Keep all chlorine containers secured to prevent falling or rolling. Use only approved methods of moving and lifting containers.

21. Maintain a good housekeeping program. This is a proven method of preventing many accidents.

22. Conduct an effective safety awareness and training program.

These are the highlights of what has been previously discussed. Whenever in doubt about the safety of any piece of equipment, structure, operation, or procedure, contact the equipment manufacturer, your city or county safety officer, or your state safety office. One of these should be able to supply you with an answer to your questions.

ACCIDENTS DON'T JUST HAPPEN... THEY ARE CAUSED!

You can be held personally liable for injuries or damages caused by an accident as a result of your negligence.

Can you afford the price of one?

Can you afford the loss of one or more operators?

Can your family afford to lose *YOU*?

14.10 ADDITIONAL READING

1. *MOP 11*, pages 156-163 or 479-496.*
2. *NEW YORK MANUAL*, pages 169-182.
3. *TEXAS MANUAL*, pages 689-706.
4. *CHLORINE – SAFE HANDLING*, PPG Industries, Inc., Chemical Division, One Gateway Center, Pittsburgh, Pennsylvania 15222.
5. *SAFETY IN WASTEWATER WORKS*, WPCF Manual of Practice No. 1, Water Pollution Control Federation, 2626 Pennsylvania Avenue, N.W., Washington, D.C. 20037. Price: $1.00 to members, $2.00 to others. Indicate your member association when ordering.
6. *SAFETY PROGRAM PROMOTIONAL PACKET*, Water Pollution Control Federation, 2626 Pennsylvania Avenue, N.W., Washington, D.C. 20037. Price $3.00 to members, $6.00 to others.
7. *CHLORINE MANUAL*, The Chlorine Institute, Inc., 342 Madison Avenue, New York, New York 10017. Price $3.00.
8. *MOTIVATING FOR SAFETY*, Journal of American Water Works Association, Vol. 61, No. 2, pp 57-59 (February 1969).

Depends on edition.

9. *CRC HANDBOOK OF LABORATORY SAFETY*, by Norman V. Steere, Chemical Rubber Publishing Company, 18901 Cranwood Parkway, Cleveland, Ohio 44128. Price $24.50.

10. *GENERAL INDUSTRY, OSHA SAFETY AND HEALTH STANDARDS* (29 CFR 1910), OSHA 2206, revised January 1976. Obtain from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Stock number 029-015-0054-6. Price $6.50.

11. *FISHER SAFETY MANUAL*, Fisher Scientific Company. 711 Forbes Avenue, Pittsburgh, Pennsylvania 15219. Price $6.00.

12. Journal Water Pollution Control Federation, Annual Yearbook, Part Two of March Issue, contains listings of publications, films and slides.

END OF LESSON 3 OF 3 LESSONS
on
PLANT SAFETY AND GOOD HOUSEKEEPING

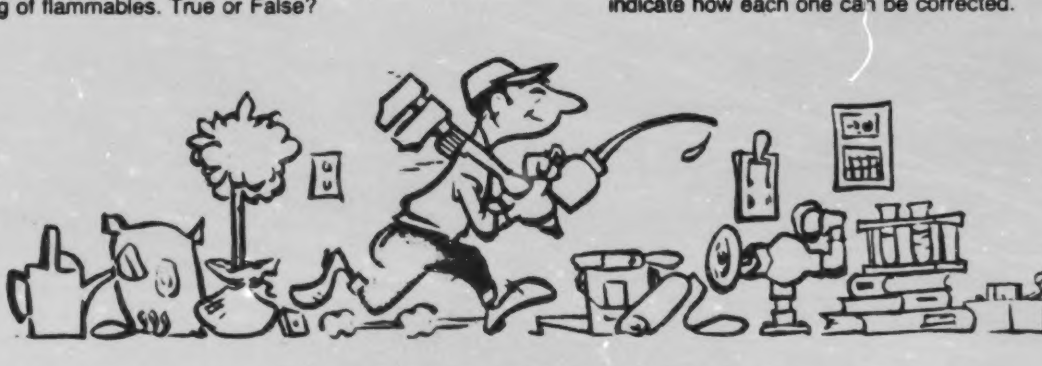
DISCUSSION AND REVIEW QUESTIONS

Chapter 14. PLANT SAFETY AND GOOD HOUSEKEEPING

(Lesson 3 of 3 Lessons)

Write the answers to these questions in your notebook. The problem numbering continues from Lesson 2.

19. How can samples for lab tests be collected without going beyond guardrails or chains?
20. What should be done with the jagged ends of glass tubes?
21. How should hot lab equipment be handled?
22. How can a fire be extinguished?
23. Fires can be prevented by good housekeeping and proper handling of flammables. True or False?
24. Why should plant water supplies be checked monthly for coliform group bacteria?
25. Why should safety equipment be checked periodically?
26. Where would you look for safety posters, signs, and slogans to aid in "tailgate" safety meetings?
27. Carefully study this illustration. List the safety hazards and indicate how each one can be corrected.



PLEASE WORK THE OBJECTIVE TEST NEXT.

Introduction to Sanitary Survey Lesson Plan

Instructor's Manual for the Training Course-Sanitary Surveys of Small Water Supplies provides an excellent example of a "package" of vocational instruction material which requires NO curriculum planning by the instructor. The instructors manual and student handbook were developed by a technical writer with assistance from a special Conference of State Sanitary Engineers' Task Force. The thoroughness of planning is illustrated in the following few pages reproduced from the Instructors Manual. It is expected that instructors and trainees who follow the detailed program outline will be well prepared to make sanitary surveys of small water supplies.

INSTRUCTOR'S MANUAL

INTRODUCTION

The purpose of this manual is to serve the instructor as a complete guide to:

- the course
- the recommended units and lessons within the course
- the content and organization of the lessons
- how to prepare for the lessons
- recommendations on presenting the units
- the participant's handbook and its use

The course is designed to permit flexibility in adapting to meet particular needs of an individual State or participant group. Should you choose to vary the course organization or to add material specific to your State or organization, the loose-leaf format will permit this.

The Manual is divided into three sections: (1) Pre-course activities, (2) Course Content and Lesson Support Material; and (3) course Assessment and Evaluation. Each of these three sections is further divided into separate elements as noted in the following Table of Contents.

It is important that you study the Manual in conjunction with the participant Handbook. The two are different because the needs are different. However, they are interdependent because what you are being asked to present is discussed and laid out in both volumes.

We hope this Manual will provide you with the necessary assistance to facilitate your preparation, delivery, and evaluation of the Course: Sanitary Surveys of Small Water Supplies. We sincerely solicit your comments and suggestions in improving and increasing the effectiveness of this and subsequent manuals.

TABLE OF CONTENTS

TAB

INTRODUCTION TO THE COURSE AND MANUAL . . . . A

TABLE OF CONTENTS . . . . B

PRE-COURSE ACTIVITIES C

- Introduction C-1
- Logistics Checklist. C-2
- "Who...When...Where" C-3
- Roster of Participants C-4
- Equipment and Facilities Checklist C-5
- Course Modification. C-6

SUBJECT MATTER OUTLINE. . . . . D

CALENDAR OF EVENTS. . . . . E

COURSE CONTENT AND LESSON SUPPORT MATERIAL. . . . . F

- Glossary of Instructional Terminology. F-1
- Introduction and Suggestions for Use of Material F-2
- Unit 1 - General Information F-3
- Unit 2 - Basic Knowledge for Sanitary Survey F-4
- Unit 3 - Preparation for the Field Survey. F-5
- Unit 4 - Public Relations. F-6
- Unit 5 - Sanitary Survey Common Elements F-7
- Unit 6 - Wells and Infiltration Gallery Sources. F-8
- Unit 7 - Spring Sources. F-9
- Unit 8 - Surface Sources F-10
- Unit 9 - Evaluation of Laboratory. F-11
- Unit 10- Cross-Connections F-12
- Unit 11- Technical Assistance F-13
- Unit 12- Survey Report F-14
- Unit 13- Additional Follow-up F-15
- Unit 14- Conclusion F-16

COURSE ASSESSMENT AND EVALUATION. . . . . G

- Introduction G-1
- Daily Participant Feedback Forms G-2
- Pre- and Post-Test Forms G-3
- Instructor Feedback Report Form. G-4
- Instructor Manual and Course Evaluation Forms. G-5
- Six Month Follow-up Questionnaire. G-6

TRAINING COURSE:

CONDUCT OF A SMALL WATER SUPPLY SANITARY SURVEY

Subject Matter Outline

UNIT NUMBER	UNIT TITLE	SUBJECT MATTER	NECESSARY CONTACT TIME
1	General Information	- Orientation to the Course; Pre-test - Introduction to the Sanitary Survey	115 minutes
2	Basic Knowledge Required for the Sanitary Survey	- Nature and Properties of Water - Water Supply Systems - Drinking Water Standards	195 minutes
3	Preparations for the Field Survey	- The Sanitary Survey Report Form - Existing Data	70 minutes
4	Survey Elements Common to most Small Water Supplies	- Pumps - Storage: Hydropneumatic Systems Gravity Systems - Maintenance Procedures for Storage Systems - Distribution Systems	315 minutes
5	Survey of Wells and Infiltration Gallery Sources	- Source Protection - Collection - Treatment	300 minutes
6	Evaluation of Laboratory	- Chlorine Residual - Turbidity	90 minutes

TRAINING COURSE: CONDUCT OF A SMALL WATER SUPPLY SANITARY SURVEY
Subject Matter Outline
Page - 2 -

UNIT NUMBER	UNIT TITLE	SUBJECT MATTER	NECESSARY CONTACT TIME
7	Survey of Spring Sources	- Source Protection - Collection - Treatment	105 minutes
8	Survey of Surface Sources	- Source Protection - Treatment and Conditioning	150 minutes
9	Cross-Connections	- Connections with other water supply systems - Connections with wastewater systems	55 minutes
10	Public Relations	- Communications	40 minutes
11	Technical Assistance	- Operational/Procedural Problems - Mechanical/Structural Problems	55 minutes
12	Survey Report	- Function of the Report - Preparation of the Report	120 minutes

TRAINING COURSE: CONDUCT OF A SMALL WATER SUPPLY SANITARY SURVEY
Subject Matter Outline

UNIT NUMBER	UNIT TITLE	SUBJECT MATTER	NECESSARY CONTACT TIME
13	Additional Follow-up	- Subsequent Inspections - Maintenance and Update of Data and Records	45 minutes
14	Conclusion	- Summary; evaluation; post-test	60 minutes
		TOTAL - 14 UNITS	1945 minutes (32 hours, 25 minutes)

UNIT 1 - LESSON #2

SUBJECT MATTER:

Introduction to the Sanitary Survey

LESSON:

Objectives and purpose of the sanitary survey; definitions of relevant terms; functions and activities performed as part of the sanitary survey.

CONTACT TIME REQUIRED:

55 minutes.

RECOMMENDED POSITION IN COURSE:

First Day, 9:30 a.m. - 10:25 a.m.

PREREQUISITES:

Ability to describe the general principles of disease transmission through the water route.

INSTRUCTIONAL STRATEGY:

Visual Aids	Time	Instructional Approach and Summary of Content	
	5 min.	A.	Present outline and introduction of lesson material.
2-1 2-2	5 min.	B.	Define sanitary survey (see Objectives #1 and #2) in writing on chalkboard or overhead projector. Lead trainees in discussion of key points of the definition. Direct the discussion toward the statement or survey objective. Write this on chalkboard or overhead projector.
2-3 2-4	15 min.	C.	Present each of the nine purposes of the sanitary survey (see Objective #3) in writing on the chalkboard or overhead, discussing each with trainees as it is presented. Use practical examples to the extent possible to illustrate each purpose.

Visual Aids	Time	Instructional Approach and Summary of Content
2-1 2-2 2-3 2-4	2 min.	D. Conclude the above by recapping with the prepared overhead transparencies.
2-5	15 min.	E. Define each of the terms of objective 4 using the prepared overhead transparencies.
2-6	10 min.	F. Lead a discussion of the six activities of Objective 5 as each is presented on the prepared overhead transparency.
	3 min.	G. Summarize.

OBJECTIVES:

(1) **Activity:** The trainee will define the term "sanitary survey".

Condition: From recall.

Performance Level: Definition will conform to the following - A sanitary survey is an on-site inspection of a public water supply system by competent personnel using a standard form, procedure and method to determine the effectiveness of the system in providing a continuously safe water to the consuming public.

(2) **Activity:** The trainee will state the objective of a sanitary survey of the small water supply.

Condition: From recall.

Performance Level: Statement will conform to the following - To assure that safe drinking water is being delivered to the public.

(3) **Activity:** The trainee will list the purposes of the sanitary survey of the small water supply.

Condition: From recall.

Performance Level: List to include six of the following nine purposes -

(a) to determine that all parts of a public water system are effective and efficient in continuously producing water which meets the primary drinking water standards of the Federal Safe Drinking Water Act.

(b) to provide on-the-job training for operation, maintenance, and management personnel concerning effective performance of the system.

(c) to provide recommendations for improvement.

(d) to determine that recommended changes are being made or that legal action is being initiated.

(e) to determine names, addresses, and phone numbers of system personnel for use in normal and emergency situations.

(f) to determine the adequacy of plans for emergency sources and treatment.

(g) to determine the adequacy of a cross-connection control program.

(h) to determine that adequate and necessary records are being maintained.

(i) to determine that adequate public and consumer notices are being provided in accordance with Federal Safe Drinking Water Act regulations.

(4) Activity: The trainee will define terms pertinent to sanitary surveys.

Condition: From recall.

Performance Level: At least 12 of the following terms are to be defined in conformity with the glossary of the manual "Small Water Systems Serving the Public" -

source
storage
distribution system
collection
treatment
conditioning
cross-connection
contamination
disinfection
well
wpring
infiltration gallery
reservoir
pollution
pump

(5) Activity: The trainee will list the activities/functions performed during the sanitary survey.

Condition: From recall.

Performance Level: List will include each of the following six activities (in trainee's own words) -

(a) inspect and evaluate the source, collection system, treatment and/or conditioning facilities and distribution system.

(b) sample (and perform and evaluate field analyses as required) to assure drinking water standards are met.

(c) review water supply facility records.

(d) discuss system problems (if any) with operational personnel (provide technical assistance as required).

(e) complete the standard survey form.

(f) prepare and submit a survey report.

JUSTIFICATION:

In order to properly perform a sanitary survey, the trainees must know what it is and why it is being performed. Terms must be understood for effective communication, both in this course and during the survey. The activities must be known before they can be performed.

INSTRUCTIONAL REFERENCE:

(a) Chapter 2 of the manual "Small Water Systems Serving the Public"

(b) Guidelines for use of the Sanitary Survey Form

PARTICIPANT MATERIALS:

Pencil, paper

INSTRUCTOR MATERIAL

Overhead projector and pen for transparencies and/or chalkboard and chalk, overhead transparencies #2-1 through #2-6.

Water Quality Lesson Plan

One of the simplest types of lesson plans involves the preparation of a list of questions which can be answered by studying assigned readings. This approach is used very heavily in self-study or home study programs. It gives to the instructor or curriculum planner complete control in deciding what should be included in the course of study. Highly motivated adults, working toward specific goals, are among the minority of persons who find much satisfaction in this type of instruction. The general usefulness of such assignments or worksheets can be increased substantially if opportunity can be provided for discussion, questions, and amplification of the worksheet answers.

The Operator Training Committee of Ohio, Inc. has prepared a workbook, Operator Training Water and Wastewater Works Operations--Basic, which exemplifies this teaching approach. The following assignment from this course of study is illustrative:

WATER TREATMENT - FIRST COURSE

THEORY AND OPERATION

ASSIGNMENT #3 Name ______________________________ Date ____________

WATER QUALITY

Objective: To aquaint the operator with some of the accepted standards governing water treatment and to discuss the physical and chemical differences of various water sources.

Assignment: Manual of Instruction for Water Treatment Plant Operators, New York State Department of Health, Chapter 6. Water Purification Control, Hopkins and Bean, Chapter 1.

Questions:

1. To protect the public health, one (1) of the objectives of water treatment implies first that the treated water must be free of ____, and second that the concentrations of any chemical substances which are ______________________________ must be reduced.

2. An aesthetically desirable water, another objective of water treatment, requires that the final product shall be as low as possible in ______________, ________________, and ______________________, and free from undesirable __________ and ______________.

3. What bacteria are most commonly tested for in water treatment?

   ____

4. There is a relationship between pathogenic bacteria and chlorination of water. What is the common test used to check chlorine concentration called?

   ____

W - 1st
T & O
#3

5. List ten (10) laboratory tests which may be performed on a surface supply water being drawn directly from a stream to the water treatment plant.

(a)

(b)

(c)

(d)

(e)

(f)

(g)

(h)

(i)

(j)

6. List the seven (7) properties of "good" water quality.

(a)

(b)

(c)

(d)

(e)

(f)

(g)

W - 1st
T & O
#3

7. List the concentrations generally acceptable in an ideal water for the following:

(a) Coliform bacteria ____________________

(b) Color ____________________

(c) Hardness ____________________

(d) Iron ____________________

(e) Magnesium ____________________

(f) Manganese ____________________

(g) Nitrate ____________________

(h) Suspended solids ____________________

(i) Threshold odor number ____________________

(j) Total dissolved solids ____________________

(k) Turbidity ____________________

8. What chemical concentrations of raw water in the ion exchange model plant exceed the acceptable limits for ideal water as defined in Question 7?

____

9. What agency is responsible for the safety and potability of drinking water used on interstate transportation facilities, such as, airplanes, buses, and trains?

____

10. What is the maximum allowable turbidity units permitted in the water treatment plant effluent?

______________________________ TU's (turbidity units)

W - 1st
T & O
#3

11. What are the exceptions to Question 10?

REFERENCE MATERIALS

REFERENCE MATERIALS

Note - Copies of those items indicated for availability by ED numbers may be obtained from ERIC Document Reproduction Service (EDRS), P. O. Box 190, Arlington, VA 22210, for prices indicated, plus postage. MF indicates availability in microfiche; PC indicates availability in paper copy. Current price codes are:

MF01	$ 0.91, plus postage
MF02	$ 1.10, plus postage
MF03	$ 1.29, plus postage
MF04	$ 1.48, plus postage
PC01	$ 2.00, plus postage
PC02	$ 3.65, plus postage
PC03	$ 5.30, plus postage
PC04	$ 6.95, plus postage
PC05	$ 8.60, plus postage
PC06	$10.25, plus postage
PC07	$11.90, plus postage
PC08	$13.55, plus postage
PC09	$15.20, plus postage
PC10	$16.85, plus postage
PC11	$18.50, plus postage
PC12	$20.15, plus postage
PC13	$21.80, plus postage
PC14	$23.45, plus postage
PC15	$25.10, plus postage
PC16	$26.75, plus postage
PC17	$28.40, plus postage
PC18	$30.05, plus postage
PC19	$31.70, plus postage
PC20	$33.35, plus postage

Prices are subject to change; consult current issues of ERIC's Resources in Education for current information.

TITLE	ADULT LEARNER AND EDUCATIONAL TELEVISION, THE.
AUTHORS	DAVID FORMAN AND PENNY RICHARDSON
PUB DATE	1976
AVAIL	ED 145 804 - MF01/PC01 PLUS POSTAGE
DESC	*ADULT CHARACTERISTICS, *ADULT EDUCATION, ADULT EDUCATION PROGRAMS, ADULT LEARNING, ADULT STUDENTS, *EDUCATIONAL NEEDS, EDUCATIONAL RESEARCH, EDUCATIONAL STRATEGIES, EDUCATIONAL TECHNOLOGY, *EDUCATIONAL TELEVISION, *INSTRUCTIONAL DESIGN, INSTRUCTIONAL INNOVATION, *STATE OF THE ART REVIEWS
DESC NOTE	23P
ABSTRACT	RELATES RECENT RESEARCH FINDINGS TO CONCEPTUAL AND PRACTICAL CONSIDERATIONS THAT PERTAIN TO EDUCATIONAL TELEVISION FOR ADULTS. ISSUES DISCUSSED FOCUS ON (1) IDENTIFICATION OF THE ADULT LEARNER, (2) THE LEARNING NEEDS OF ADULTS, (3) ROLES TELEVISION CAN PLAY IN ADULT EDUCATION PROGRAMS, AND (4) GUIDELINES FOR DESIGNING PROGRAMS FOR ADULT LEARNERS. STUDIES BY THE AUTHORS ON THE LEARNING STYLES OF ADULTS ARE AMONG THE RESEARCH PROJECTS CITED.

TITLE	ADULT LEARNING PRINCIPLES AND THEIR APPLICATION TO PROGRAM PLANNING.
AUTHORS	DONALD H. BRUNDAGE AND DOROTHY MACKERACHER
PUB DATE	1980
AVAIL	ED 181 292 - MF01/PC06 PLUS POSTAGE
DESC	*ADULT CHARACTERISTICS, *ADULT EDUCATION, *ADULT LEARNING, ADULTS, COGNITIVE STYLE, *EDUCATIONAL PRINCIPLES, *GUIDELINES, LEARNING CHARACTERISTICS, LEARNING MOTIVATION, LEARNING PROCESSES, *PROGRAM PLANNING, SELF CONCEPT, TEACHER EDUCATION, TEACHING METHODS
DESC NOTE	134P
ABSTRACT	EXAMINES ADULT LEARNING PRINCIPLES DEVELOPED THROUGH AN ANALYSIS AND SYNTHESIS OF THE LITERATURE IN ADULT EDUCATION, ANDRAGOGY, TEACHING AND LEARNING, AND OTHER RELATED FIELDS.
INST NAME	ONTARIO DEPARTMENT OF EDUCATION, TORONTO

TITLE	ADVANCED INSTRUCTIONAL TECHNOLOGY. STAFF GUIDE.
PUB DATE	NOV 79
AVAIL	EPA INSTRUCTIONAL RESOURCES CENTER, THE OHIO STATE UNIVERSITY, 1200 CHAMBERS ROAD - 3RD FLOOR, COLUMBUS, OH 43212 ($1.00 PER DOCUMENT PLUS $0.03 PER PAGE.)

DESC	AUDIOVISUAL AIDS, BEHAVIORAL OBJECTIVES, COMMUNICATION SKILLS, *INSTRUCTIONAL STAFF, PROFESSIONAL DEVELOPMENT, *SKILL DEVELOPMENT, TASK ANALYSIS, *TEACHING EXPERIENCE, *TRAINING TECHNIQUES, WATER POLLUTION CONTROL
DESC NOTE	242P
ABSTRACT	THIS STAFF GUIDE ACCOMPANIES A TEN-UNIT WORKSHOP DESIGNED TO ASSIST SUPERVISORS AND OTHER PERSONNEL RESPONSIBLE FOR TRAINING TO STRENGTHEN AND EXPAND INSTRUCTIONAL EFFECTIVENESS. SKILLS ADDRESSED INCLUDE: DESIGNING INSTRUCTIONAL OBJECTIVES, EVALUATING ACHIEVEMENT, CHOOSING INSTRUCTIONAL STRATEGIES, UTILIZING MEDIA, AND MANAGING INSTRUCTION. THE MATERIAL IS DESIGNED FOR FLEXIBILITY IN CHOICE AND SEQUENCE OF UNITS AS WELL AS SCHEDULE OF PRESENTATION.
INST NAME	DEVELOPMENT AND EVALUATION ASSOCIATES, INC., SYRACUSE, NY

TITLE	AFFECTIVE EDUCATION HANDBOOK FOR VOCATIONAL EDUCATION.
AUTHORS	NANCY L. ODUM AND OTHERS
PUB DATE	1979
AVAIL	VOCATIONAL EDUCATION MEDIA CENTER, 10 TILLMAN HALL, CLEMSON UNIVERSITY, CLEMSON, SC 29631 ($2.00) - ED 176 045 - MF01/PC04 PLUS POSTAGE
DESC	*AFFECTIVE BEHAVIOR, *AFFECTIVE OBJECTIVES, EMPLOYER EMPLOYEE RELATIONSHIP, *LEARNING ACTIVITIES, *LEARNING MODULES, PRODUCTIVITY, RESPONSIBILITY, STUDENT ATTITUDES, VALUES, *VOCATIONAL EDUCATION, WORK ATTITUDES
DESC NOTE	83P
ABSTRACT	DESIGNED TO INTRODUCE THE VOCATIONAL TEACHER TO ACTIVITIES THROUGH WHICH PEER INTERACTION PROMOTES THE UNDERSTANDING OF SELF AND OTHERS IN A WORKING ENVIRONMENT, THIS HANDBOOK PROVIDES ACTIVITIES THAT FOCUS ON ATTITUDES, INTERESTS, AND VALUES DEVELOPMENT.
INST NAME	CLEMSON UNIVERSITY, SC VOCATIONAL EDUCATION MEDIA CENTER; SOUTH CAROLINA STATE DEPARTMENT OF EDUCATION, COLUMBIA. OFFICE OF VOCATIONAL EDUCATION

TITLE	AGRICULTURAL PESTICIDES. AN INSTRUCTIONAL UNIT FOR TEACHERS OF ADULT VOCATIONAL EDUCATION IN AGRICULTURE.
AUTHORS	KENNETH M. HARRISON AND MAYNARD J. IVERSON
PUB DATE	1975

AVAIL ED 112 253 - MF01/PC07 PLUS POSTAGE
DESC *ADULT FARMER EDUCATION, ADULT VOCATIONAL
EDUCATION, AGRICULTURAL EDUCATION, *CURRICULUM
GUIDES, DISEASE CONTROL, HERBICIDES, INSECTICIDES,
INSTRUCTIONAL MATERIALS, *PESTICIDES,
RODENTICIDES, TEACHING GUIDES, VOCATIONAL
AGRICULTURE, *YOUNG FARMER EDUCATION
DESC NOTE 170P THE PROPER USE OF AGRICULTURAL PESTICIDES IS
ABSTRACT THE MAJOR EMPHASIS ON THE UNIT OF INSTRUCTION
DEVELOPED AS A GUIDE FOR USE BY TEACHERS IN
PLANNING AND CONDUCTING YOUNG FARMER AND ADULT
FARMER CLASSES. SEVEN LESSONS ARE INCLUDED IN THE
UNIT COVERING TOPICAL AREAS RELATED TO THE
UTILIZATION OF PESTICIDES, HERBICIDES,
INSECTICIDES, FUNGICIDES, AND THE DEVELOPMENT OF A
COMPREHENSIVE PEST CONTROL PROGRAM. SUGGESTIONS
FOR TEACHING THE LESSONS AND SUGGESTED MATERIALS
ARE PRESENTED. TEACHING FORMS AND A UNIT
EVALUATION QUESTIONNAIRE ARE PRESENTED.

CAREER EDUCATION CONSULTING PACKAGE. PACK VI.
TITLE HANDOUTS AND TRANSPARENCIES.
1976
PUB DATE WEST VIRGINIA VOCATIONAL CURRICULUM LABORATORY,
AVAIL CEDAR LAKES, RIPLEY, WV 25271 (six packages,
$10.00) - ED 137 627 - MF01/PC04 PLUS POSTAGE
*CAREER EDUCATION, *CONSULTANTS, *CURRICULUM
DESC DEVELOPMENT, ELEMENTARY SECONDARY EDUCATION,
*PROGRAM PLANNING, RESOURCE MATERIALS, *WORKSHOPS
83P
DESC NOTE THIS PACKAGE OF HANDOUTS AND TRANSPARENCIES IS ONE
ABSTRACT OF A SET OF SIX PACKAGES OF CONSULTANTS' MATERIALS
DEVELOPED TO SERVE AS A GUIDE FOR CONSULTING STAFF
PRESENTING CAREER EDUCATION WORKSHOPS IN THE
FOLLOWING AREAS: COUNSELORS, PRIMARY K-3, JUNIOR
AND SENIOR HIGH, INTERMEDIATE, AND ADMINISTRATORS.
THE 17 HANDOUTS AND 3 TRANSPARENCIES ARE TO BE
COORDINATED WITH WORKSHOP ACTIVITIES IN THE OTHER
PACKAGES. MAJOR TOPICS COVERED IN THE HANDOUTS
ARE "STRAIGHT ANSWERS ON CAREER EDUCATION" (BY
KENNETH HOYT), "THINKING OF BRINGING CAREER
EDUCATION TO YOUR SCHOOL SYSTEM," AND "CAREER
EDUCATION--WHERE ARE WE GOING?"
MARSHALL UNIVERSITY, HUNTINGTON, WV; REGIONAL
INST NAME EDUCATION SERVICE AGENCY, REGION 5, PARKERSBURG,
WV, WEST VIRGINIA STATE DEPARTMENT OF EDUCATION,
CHARLESTON. BUREAU OF VOCATIONAL, TECHNICAL, AND
ADULT EDUCATION.

TITLE	CARIBBEAN BASIN WATER MANAGEMENT PROJECT: INSTRUCTOR'S MANUAL & PLANNING GUIDE FOR TRAINING OF TRAINERS.
AUTHORS	JOHN H. AUSTIN AND OTHERS
PUB DATE	OCT 78
AVAIL	ENGINEER NEIL F. CAREFOOT, PROJECT MANAGER, PAHO/WHO, P. O. BOX 508, BRIDGETOWN, BARBADOS
DESC	*CARIBBEAN, *EDUCATIONAL NEEDS, *EDUCATIONAL PROGRAMS, *INSTRUCTION, INSTRUCTIONAL MATERIALS, *INTERNATIONAL EDUCATION, *INSERVICE EDUCATION, *MANAGEMENT, *PLANNING, TRAINING, *TRAINING PROGRAMS, *TECHNICAL COOPERATION, *WATER RESOURCES
DESC NOTE	435P
ABSTRACT	THIS INSTRUCTOR'S MANUAL AND PLANNING GUIDE HAS BEEN DEVELOPED FOR THE TRAINING OF TRAINERS IN THE CARIBBEAN BASIN WATER MANAGEMENT PROJECT. THE MANUAL AIMS TO INCREASE TRAINING EFFECTIVENESS IN ORDER TO IMPROVE MANAGERIAL AND OPERATIONAL COMPETENCE. INNOVATIVE METHODS ARE OUTLINED TO CLOSE THE TRAINING GAP AND SIMULTANEOUSLY DEVELOP IN-COUNTRY CAPABILITIES FOR SUSTAINING A TRAINING DELIVERY SYSTEM. THE PROPOSED METHODOLOGIES EMPHASIZE THE NECESSITY OF ESTABLISHING A FRAMEWORK TO FACILITATE TECHNICAL COOPERATION AMONG THE COUNTRIES OF THE EASTERN CARIBBEAN.

TITLE	CHARACTERISTICS OF ADULTS THAT FACILITATE AND/OR INTERFERE WITH LEARNING.
AUTHORS	ROBERT G. NORRIS
PUB DATE	1977
AVAIL	ED 150 442 - MF01/PC01 PLUS POSTAGE
DESC	ACADEMIC ACHIEVEMENT, *ADULT CHARACTERISTICS, ADULT DEVELOPMENT, ADULT EDUCATION, *ADULT LEARNING, ADULTS, AGE, *AGE DIFFERENCES, EDUCATIONAL NEEDS, EDUCATIONAL PLANNING, EDUCATIONAL PROBLEMS, LEARNING, LEARNING CHARACTERISTICS, *LEARNING DIFFICULTIES, PHYSICAL CHARACTERISTICS, PSYCHOLOGICAL CHARACTERISTICS, SOCIAL CHARACTERISTICS, TEACHER INFLUENCE, TEACHER ROLE, *TEACHING METHODS, TEACHING STYLES
DESC NOTE	14P
ABSTRACT	TEACHERS OF ADULTS, IF THEY ARE TO BE REALLY EFFECTIVE, MUST BE SENSITIVE TO THE PARTICULAR CHARACTERISTICS AND NEEDS OF ADULT LEARNERS. ADULTS HAVE MANY PHYSIOLOGICAL, PSYCHOLOGICAL, AND SOCIAL CHARACTERISTICS THAT ARE THE RESULT OF NORMAL AGING. IN DETERMINING WHICH CHARACTERISTICS INTERFERE WITH LEARNING, IT IS

FOUND THAT ALL HAVE AN IMPACT ON THE LEARNING PROCESSES BUT FEW IMPAIR THE ADULT FROM LEARNING.

TITLE	COMPETENCY-BASED VOCATIONAL EDUCATION: IMPLICATIONS FOR VOCATIONAL TEACHER EDUCATORS.
AUTHORS	JOHN HILLISON AND CURTIS FINCH
PUB DATE	MAY 79
AVAIL	ED 174 800 - MF01/PC03 PLUS POSTAGE
DESC	DELIVERY SYSTEMS, EDUCATIONAL ALTERNATIVES, MINIMUM COMPETENCY TESTING, *PERFORMANCE BASED EDUCATION, *PROGRAM DESIGN, *PROGRAM DEVELOPMENT, SCHOOL DISTRICTS, SPEECHES, STATE PROGRAMS, *TEACHER EDUCATION, TEACHER EDUCATORS, *VOCATIONAL EDUCATION
DESC NOTE	65P
ABSTRACT	THIS REPORT PRESENTS FOUR PRESENTATIONS MADE AT A WORKSHOP WHICH WAS HELD IN RICHMOND, VIRGINIA, TO ASSIST TEACHER EDUCATORS TO BETTER PREPARE VOCATIONAL TEACHERS FOR COMPETENCY-BASED INSTRUCTION.

TITLE	COMPLEMENTAL APPROACH TO INSTRUCTIONAL DEVELOPMENT, A.
AUTHORS	M. H. HASSAN
PUB DATE	JUN 78
AVAIL	ED 160 029 - MF01/PC01 PLUS POSTAGE
DESC	*BEHAVIOR THEORIES, *CURRICULUM DEVELOPMENT, EDUCATIONAL IMPROVEMENT, *EDUCATIONAL STRATEGIES, *HUMANISTIC EDUCATION, *INSTRUCTIONAL IMPROVEMENT, INTELLECTUAL DEVELOPMENT, *LEARNING THEORIES, OPERANT CONDITIONING
DESC NOTE	12P; PAPER PRESENTED AT THE FIRST CONGRESS ON EDUCATION (TORONTO, JUNE 1978)
ABSTRACT	IN ITS RELATIVELY SHORT HISTORY, INSTRUCTIONAL DEVELOPMENT HAS BEEN GREATLY INFLUENCED BY OPERANT CONDITIONING THEORY AND METHODOLOGY. THIS APPROACH HAS BEEN DESCRIBED BY SOME AS SIMPLISTIC, INHUMAN, AND INFLEXIBLE. THE HUMANISTIC APPROACH ON THE OTHER HAND, FOCUSES ON AFFECTIVE, EMOTIONAL, AND INTELLECTUAL LEARNING EXPERIENCES. BUT IT SEEMS TO LACK A DEFINITE POSITION AND PRECISE PROCEDURES. THE TWO APPROACHES ARE EXAMINED AND COMPARED. IT IS SUGGESTED, THROUGH THE CONCEPT OF COMPLEMENTARITY, THAT BOTH PERSPECTIVES ARE USEFUL AND NEEDED FOR A COMPLETE INSTRUCTIONAL DEVELOPMENT OPERATION. A TENTATIVE PROGRAM OF ACTION IS PROPOSED FOR DISCUSSION.

TITLE	CONSIDERATIONS IN SELECTING AND USING INSTRUCTIONAL OBJECTIVES.
AUTHORS	HOWARD J. SULLIVAN
PUB DATE	JAN 73
AVAIL	INSTRUCTIONAL OBJECTIVES EXCHANGE, P. O. BOX 24095, LOS ANGELES, CA 90024 ($2.95)
DESC	*ACADEMIC STANDARDS, BEHAVIORAL OBJECTIVES, CURRICULUM DESIGN, *CURRICULUM PLANNING, EDUCATIONAL ASSESSMENT, *EDUCATIONAL OBJECTIVES, ELEMENTARY SECONDARY EDUCATION, INSTRUCTIONAL DESIGN, *RELEVANCE (EDUCATION), *SELECTION, STUDENT EVALUATION
DESC NOTE	18P
ABSTRACT	IMPORTANT FACTORS TO CONSIDER IN SELECTING INSTRUCTIONAL OBJECTIVES AND IN DESIGNING OBJECTIVES-BASED INSTRUCTION ARE LISTED AND DISCUSSED. EACH FACTOR IS STATED AS A QUESTION, SO THAT THE FACTORS CAN BE USED EFFICIENTLY IN SELECTING APPROPRIATE OBJECTIVES AND DESIGNING EFFECTIVE INSTRUCTION.
INST NAME	INSTRUCTIONAL OBJECTIVES EXCHANGE, LOS ANGELES, CA

TITLE	CRITERIA FOR THE ESTABLISHMENT AND MAINTENANCE OF TWO YEAR POST HIGH SCHOOL WASTEWATER TECHNOLOGY TRAINING PROGRAMS. VOLUME II: CURRICULUM GUIDELINES.
PUB DATE	1971
AVAIL	ED 066 576 - MF01/PC20 PLUS POSTAGE
DESC	*BEHAVIORAL OBJECTIVES, *CURRICULUM DEVELOPMENT, EDUCATIONAL PROGRAMS, ENVIRONMENTAL EDUCATION, *GUIDELINES, POST SECONDARY EDUCATION, PROGRAM DEVELOPMENT, *TECHNICAL EDUCATION, VOCATIONAL EDUCATION, *WATER POLLUTION CONTROL
DESC NOTE	480P
ABSTRACT	THIS PUBLICATION, PREPARED BY REPRESENTATIVES OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY, PLANT OPERATIONS, VOCATIONAL-TECHNICAL SCHOOLS, PROFESSIONAL ASSOCIATIONS, AND UNIVERSITIES IS THE SECOND OF A TWO-VOLUME SERIES AND CONTAINS GUIDELINES WHICH MAY BE USED IN ESTABLISHING A TWO-YEAR OR LESS POST-SECONDARY WASTEWATER TECHNOLOGY TRAINING PROGRAM. FOCUSING ON THE POSTTRAINING PERFORMANCE DESIRED OF TRAINEES, THE GUIDELINES ARE DESIGNED TO PROVIDE PRACTICAL, HANDS-ON SKILL AND KNOWLEDGE DIRECTLY RELATED TO THE OPERATION AND MANAGEMENT OF A WASTEWATER TREATMENT PLANT.
INST NAME	CLEMSON UNIVERSITY, SOUTH CAROLINA DEPARTMENT OF ENVIRONMENTAL SYSTEMS ENGINEERING

TITLE	CRITERIA FOR THE ESTABLISHMENT AND MAINTENANCE OF TWO YEAR POST HIGH SCHOOL WASTEWATER TECHNOLOGY TRAINING PROGRAMS. TRAINEE WORKBOOKS.
PUB DATE	AUG 73
AVAIL	ED 148 586 - MF01 PLUS POSTAGE
DESC	*CURRICULUM, EDUCATIONAL PROGRAMS, *ENVIRONMENT, INSTRUCTION, JOB TRAINING, MAINTENANCE, *POST SECONDARY EDUCATION, SAFETY, *TECHNICAL EDUCATION, *WATER POLLUTION CONTROL
DESC NOTE	440P
ABSTRACT	THIS DOCUMENT IS ONE IN A SERIES WHICH MAY BE USED IN ESTABLISHING A TWO YEAR POST SECONDARY WASTEWATER TECHNOLOGY TRAINING PROGRAM. THE WORKBOOK PROVIDES THE OBJECTIVES OF INSTRUCTION; A MEANS OF STANDARDIZING INSTRUCTION AND EVALUATION; AND APPROACHES TO INSTRUCTION TO MAXIMIZE TRAINEE INVOLVEMENT AND RETENTION. THE GUIDELINES ARE DESIGNED TO PROVIDE PRACTICAL, HANDS-ON SKILL AND KNOWLEDGE DIRECTLY RELATED TO THE OPERATION AND MANAGEMENT OF A WASTEWATER TREATMENT PLANT.
INST NAME	CLEMSON UNIVERSITY, SOUTH CAROLINA DEPARTMENT OF ENVIRONMENTAL SYSTEMS ENGINEERING

TITLE	CURRICULUM ACTIVITIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES, ACTIVITIES. APPENDICES, VOLUME 1 AND VOLUME 2.
AUTHORS	JOHN T. HERSHEY AND OTHERS
PUB DATE	1972
AVAIL	SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, DC 20402 ($2.25) - ED 154 986 - MF02/PC20 PLUS POSTAGE
DESC	*CURRICULUM GUIDES, ECOLOGY, *ENVIRONMENTAL EDUCATION, *INSTRUCTIONAL MATERIALS, NATURAL RESOURCES, OUTDOOR EDUCATION, POLLUTION, *SECONDARY EDUCATION, *WATER RESOURCES
DESC NOTE	490P
ABSTRACT	THIS ACTIVITY ORIENTED GUIDE IS DIVIDED INTO FOUR SECTIONS DEALING WITH THE HYDROLOGIC CYCLE: HUMAN ACTIVITIES; ECOLOGICAL PERSPECTIVES; AND SOCIAL AND POLITICAL FACTORS. THE APPENDICES INCLUDE A DISCUSSION OF WATER QUALITY PARAMETERS, AIDS TO IMPLEMENTATION, SUGGESTIONS REGARDING LIMITATIONS, SUGGESTIONS FOR EVALUATION, A BIBLIOGRAPHY, A WATER POLLUTION AND ENVIRONMENTAL GLOSSARY, AND COMMENTS ABOUT LABORATORY AND FIELD SAFETY.
INST NAME	TILTON SCHOOL, NH

TITLE	DEVELOPING TROUBLESHOOTING SKILLS.
AUTHORS	RALPH F. JANSEN, DIRECTOR
DESC NOTE	1974
AVAIL	TECHNICAL PUBLISHING COMPANY (TPC) TRAINING SYSTEMS, 1301 SO. GROVE, BARRINGTON, IL 60010 ($26.75 SEPARATE, $267.50 COMPLETE COURSE 1503)
DESC	*INDIVIDUALIZED INSTRUCTION, *INSTRUCTIONAL MATERIALS, *MAINTENANCE, PROBLEM SOLVING, *PROGRAMMED INSTRUCTION, SKILL DEVELOPMENT, *TRAINING PROGRAMS, *TROUBLESHOOTING, WORKBOOK
DESC NOTE	160P
ABSTRACT	THIS TRAINEE'S GUIDE CONTAINS TEN LESSONS ON DEVELOPING TROUBLESHOOTING SKILLS. THE TOPICS OF THE TEN LESSONS ARE: YOUR JOB IN MAINTENANCE, DEVELOPING GOOD WORKING HABITS. TROUBLESHOOTING TECHNIQUES, AIDS TO TROUBLESHOOTING, TROUBLESHOOTING WITH SCHEMATICS, BREAKDOWN MAINTENANCE, PREPARATIONS FOR TROUBLESHOOTING, SOLVING MECHANICAL PROBLEMS. SOLVING ELECTRICAL PROBLEMS, AND PLANNED MAINTENANCE. EACH LESSON CONTAINS A PRESENTATION OF MATERIAL, PROGRAMMED EXERCISES, AND A COMPLETION QUIZ.

TITLE	DEVELOPMENT OF A COMPETENCY-BASED CURRICULUM FOR UPGRADING WATER TREATMENT TECHNICIANS. FINAL REPORT.
AUTHORS	MELINDA ROSS-HARRINGTON
PUB DATE	10 AUG 77
AVAIL	ED 145 236 - MF01/PC03 PLUS POSTAGE
DESC	ADULT EDUCATION, CHEMISTRY, CURRICULUM DESIGN, *CURRICULUM DEVELOPMENT, CURRICULUM PLANNING INSERVICE EDUCATION, JOB SKILLS, JOB TRAINING, PARAPROFESSIONAL PERSONNEL, *PERFORMANCE BASED EDUCATION, POST SECONDARY EDUCATION, TASK ANALYSIS, *TECHNICAL EDUCATION, TECHNICAL OCCUPATIONS, TRADE AND INDUSTRIAL EDUCATION, *UTILITIES, *WATER RESOURCES
DESC NOTE	73P
ABSTRACT	THE MAJOR PURPOSE OF THIS PROJECT HAS BEEN TO DEVELOP AN INSTRUCTIONAL PROGRAM FOR TRAINING WATER TREATMENT TECHNICIANS THROUGH THE COOPERATIVE EFFORTS OF INDUSTRY, THE REGULATORY AGENCY (WEST VIRGINIA STATE DEPARTMENT OF HEALTH), AND VOCATIONAL EDUCATION.
INST NAME	WEST VIRGINIA RESEARCH COORDINATING UNIT FOR VOCATIONAL EDUCATION, HUNTINGTON

TITLE	EXTENDED AERATION PLANT OPERATORS SKILL TRAINING PROGRAM-INSTRUCTOR SET AND INDIVIDUAL STUDENT MATERIALS.
PUB DATE	1975
AVAIL	WATER POLLUTION CONTROL FEDERATION, 2626 PENNSYLVANIA AVENUE, NW, WASHINGTON, DC 20037 ($140.00)
DESC	*AUDIOVISUAL AIDS, EQUIPMENT, *EXTENDED AERATION PLANTS, EFFLUENTS, *FACILITIES, *INSTRUCTIONAL MATERIALS, *OPERATIONS (WASTEWATER), POST SECONDARY EDUCATION, WATER POLLUTION CONTROL, *WASTEWATER TREATMENT, WASTE DISPOSAL
DESC NOTE	225P
ABSTRACT	THIS EXTENDED AERATION SKILL TRAINING PROGRAM IS DESIGNED FOR THOSE STUDENTS WHO HAVE SUCCESSFULLY COMPLETED THE WATER POLLUTION CONTROL FEDERATION'S BASIC COURSE FOR WASTEWATER TREATMENT PLANT OPERATIONS. THE PROGRAM PROVIDES AN OVERALL DESCRIPTION OF THE EXTENDED AERATION TREATMENT PLANT. A DESCRIPTION OF THE INDIVIDUAL COMPONENTS WHICH PERFORM THE MAJOR OPERATING FUNCTIONS, SPECIFIC OPERATING INFORMATION AND CORRECTIVE/PREVENTIVE MAINTENANCE ADVICE. THE PROGRAM INCLUDES CASSETTE, TAPES, SLIDES, PROGRAM ADMINISTRATORS HANDBOOK AND STUDENT SELF-INSTRUCTION WORKBOOK.

TITLE	FIFTY HINTS FOR TEACHERS OF VOCATIONAL SUBJECTS.
AUTHORS	M. R. BASS
PUB DATE	1976
AVAIL	AMERICAN TECHNICAL SOCIETY, 848 EAST 58TH STREET, CHICAGO, IL 60637 (10 FOR $50.00)
DESC	*INSTRUCTION, *INSTRUCTIONAL MATERIALS, *TEACHER EDUCATION, TECHNICAL EDUCATION, *VOCATIONAL EDUCATION.
DESC NOTE	64P
ABSTRACT	PRESENTS BRIEF, TO-THE-POINT TEACHING HINTS FOR VOCATIONAL TEACHERS.

TITLE	HANDBOOK FOR TEACHERS OF ADULT OCCUPATIONAL EDUCATION.
PUB DATE	1977
AVAIL	ED 149 160 - MF01/PC05 PLUS POSTAGE
DESC	ADULT EDUCATORS, ADULT LEARNING, *ADULT VOCATIONAL EDUCATION, *AUDIOVISUAL AIDS, COURSE EVALUATION CURRICULUM PLANNING, NONINSTRUCTIONAL RESPONSIBILITY, POST SECONDARY EDUCATION, SECONDARY EDUCATION, SELF EVALUATION, *STUDENT EVALUATION, STUDENT MOTIVATION, STUDENT NEEDS,

	*STUDENT TEACHER RELATIONSHIP, TEACHER EVALUATION, TEACHING GUIDES, *TEACHING METHODS, *TEACHING SKILLS, TEST CONSTRUCTION, VOCATIONAL EDUCATION
DESC NOTE	104P
ABSTRACT	THIS HANDBOOK IS DESIGNED TO ASSIST OCCUPATIONALLY SKILLED INDIVIDUALS TO BECOME COMPETENT INSTRUCTORS IN THEIR FIELD. IT COVERS TOPICS INTENDED TO BE OF INTEREST TO NEW INSTRUCTORS DURING THEIR FIRST FEW WEEKS OF TEACHING.
INST NAME	NEW YORK STATE EDUCATION DEPARTMENT, ALBANY. BUREAU OF OCCUPATIONAL AND CAREER CURRICULUM DEVELOPMENT.

TITLE	IDAHO WATER SYSTEMS: OPERATORS-READING ASSIGNMENTS AND EXERCISES-CLASS I AND II AND CLASS III AND IV.
AUTHORS	A. T. WALLACE
PUB DATE	1970
AVAIL	IDAHO DEPARTMENT OF HEALTH & WELFARE, DIVISION OF ENVIRONMENT, STATEHOUSE, BOISE, ID 83720 ($1.00)
DESC	*AUTOINSTRUCTIONAL AIDS, *CERTIFICATION, *INSTRUCTIONAL MATERIALS, MATHEMATICS, *IDAHO, *OPERATORS (WATER), *POST SECONDARY EDUCATION, READING ASSIGNMENTS, STATE PROGRAMS, TECHNOLOGY, *TRAINING PROGRAMS, *WATER TREATMENT, *WATER RESOURCES, WATER QUALITY
DESC NOTE	80P
ABSTRACT	PRESENTED ARE THE READING ASSIGNMENTS AND EXERCISES FOR A COURSE TO PREPARE IDAHO CLASS I-IV WATER SYSTEM OPERATORS FOR THE STATE CERTIFICATION EXAMINATION. UTILIZED IS THE PROGRAMMED LEARNING INSTRUCTIONAL METHOD. ADDRESSED IN PART I ARE MATHEMATICS, CHEMISTRY, AND WATER TREATMENT TECHNOLOGY. PART II INCLUDES EXERCISES ON MATHEMATICS, CHEMISTRY, HYDRAULICS AND ELECTRICITY, WATER SOURCES, WATER QUALITY, COAGULATION AND SEDIMENTATION, SAND FILTRATION, DISINFECTION, MISCELLANEOUS CHEMICAL TREATMENT, TASTE AND ODOR CONTROL, CORROSION. THE LABORATORY EXAMINATION, AND MANAGEMENT.

TITLE	IDENTIFICATION AND ANALYSIS OF COMPETENCY-BASED ADULT VOCATIONAL EDUCATION PROGRAMS. FINAL REPORT. RESEARCH AND DEVELOPMENT SERIES NO. 132.
AUTHORS	EARL B. RUSSELL AND OTHERS
PUB DATE	JAN 78
AVAIL	NATIONAL CENTER FOR RESEARCH IN VOCATIONAL EDUCATION PUBLICATIONS, OHIO STATE UNIVERSITY, 1960 KENNY ROAD, COLUMBUS, OH 43210 ($3.25) - ED 153 051 - MF01/PC03 PLUS POSTAGE

DESC	*ADULT EDUCATION PROGRAMS, *ADULT VOCATIONAL EDUCATION, BUSINESS, DIRECTORIES, *EDUCATIONAL PRACTICE, *INFORMATION DISSEMINATION, NATIONAL SURVEYS, *PERFORMANCE BASED EDUCATION, PRIVATE AGENCIES, PRIVATE SCHOOLS, PROPRIETARY SCHOOLS, PUBLIC SCHOOLS, WORKSHOPS
DESC NOTE	54P
ABSTRACT	THIS FINAL REPORT FROM A PROJECT TO IDENTIFY AND ANALYZE COMPETENCY-BASED VOCATIONAL EDUCATION PROGRAMS IN THE U.S. PRESENTS AN OVERVIEW OF THE WHOLE PROJECT AND INCLUDES THE LITERATURE REVIEW AND A SUMMARY OF FINDINGS.

TITLE	INDIANA BASIC WATER TREATMENT AND DISTRIBUTION WORKBOOK.
AUTHORS	MICHAEL PHILLIPS
PUB DATE	1979
AVAIL	INDIANA SECTION AWWA, 1330 WEST MICHIGAN, INDIANAPOLIS, IN 46206 ($4.00)
DESC	BIOLOGY, CHEMISTRY, *WATER DISTRIBUTION, *INSTRUCTIONAL MATERIALS, LEGISLATION, MATHEMATICS, *MANAGEMNT, NATURAL RESOURCES, *PLANNING, REGULATIONS, STORAGE, UTILITIES, *WATER SUPPLY, *WATER TREATMENT, WATER RESOURCES
DESC NOTE	65P
ABSTRACT	THIS WORKBOOK CONTAINS QUESTIONS ON THE PHYSICAL, CHEMICAL, MATHEMATICAL AND BIOLOGICAL ASPECTS OF WATER TREATMENT AND DISTRIBUTION. THE INSTITUTIONAL, TECHNOLOGICAL AND LEGAL ISSUES THAT ARE RELEVANT TO WATER RESOURCES PLANNING AND MANAGEMENT ARE PRESENTED. INCLUDED ARE DISCUSSIONS OF SOURCES OF WATER USES, AND PRESENT AND FUTURE NEEDS.

TITLE	INSTRUCTORS AND THEIR JOBS.
AUTHORS	W. R. MILLER AND H. C. ROSE
PUB DATE	1975
AVAIL	AMERICAN TECHNICAL SOCIETY, 848 EAST 58TH STREET, CHICAGO, IL 60637 ($10.65)
DESC	VISUAL AIDS, INDIVIDUALIZED INSTRUCTION, *INSTRUCTION, *INSTRUCTIONAL MATERIALS, *TEACHER EDUCATION, *TECHNICAL EDUCATION
DESC NOTE	334P
ABSTRACT	INCLUDES THE BASIC CONCEPTS OF WHAT IT TAKES TO MAKE A GOOD INSTRUCTOR. MATERIAL ON AUDIO-VISUAL PRESENTATIONS AND TEACHING MACHINES IS PRESENTED. ALTHOUGH TECHNICALLY ORIENTED, THE TEACHING CONCEPTS APPLY TO ANY CLASSROOM SITUATION. DEFINES THE INSTRUCTOR'S ROLE IN TRAINING PROGRAMS.

TITLE	INSTRUCTOR'S MANUAL FOR THE TRAINING COURSE, "SANITARY SURVEYS OF SMALL WATER SUPPLIES."
PUB DATE	FEB 79
AVAIL	CONFERENCE OF STATE SANITARY ENGINEERS, MEREDITH H. THOMPSON, EXECUTIVE SECRETARY, ONE DEERFIELD DRIVE, TROY, NY 12180
DESC	*DRINKING WATER, EDUCATIONAL PROBLEMS, *INSTRUCTIONAL MATERIALS, *INSTRUCTORS MANUAL, JOB TRAINING, LABORATORY TECHNIQUES, *SANITARY SURVEYS, SEMINARS, TEACHING GUIDES, *TRAINING MANUALS, WATER RESOURCES, *WATER SUPPLY
DESC NOTE	200P
ABSTRACT	THIS INSTRUCTOR'S MANUAL HAS BEEN DEVELOPED FOR USE IN TRAINING PERSONNEL IN THE TECHNIQUES OF MAKING A SANITARY SURVEY OF PUBLIC WATER SUPPLY SYSTEMS. IT IS INTENDED FOR USE IN CONDUCTING TECHNICAL ASSISTANCE SEMINARS FOR STATE AND LOCAL AGENCY PERSONNEL RESPONSIBLE FOR THE STATE PUBLIC WATER SUPPLY PROGRAM UNDER THE FEDERAL SAFE DRINKING WATER ACT. THE MANUAL IS DIVIDED INTO THREE SECTIONS: (1) PRE-COURSE ACTIVITIES, (2) COURSE CONTENT AND LESSON SUPPORT MATERIAL, AND (3) COURSE ASSESSMENT AND EVALUATION. A TRAINEE'S MANUAL ACCOMPANIES THIS.

TITLE	INVESTIGATION OF CURRICULA MATERIALS AND METHODOLOGY.
AUTHORS	J. C. BROWN
PUB DATE	1972
AVAIL	WATER RESOURCES RESEARCH INSTITUTE, 124 RIDDICK BUILDING, NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NC 27607 ($4.00)
DESC	*CURRICULUM, *INSTRUCTION, *INSTRUCTIONAL MATERIALS, *OPERATIONS (WASTEWATER), POST SECONDARY EDUCATION, *WASTEWATER TREATMENT
ABSTRACT	GUIDE FOR AN INSTRUCTOR IN SETTING UP AN INSTRUCTIONAL PROGRAM FOR TRAINING WASTEWATER TREATMENT OPERATORS.

TITLE	JOB INSTRUCTION: THE COMMUNICATION OF ABILITY.
AVAIL	ROUNDTABLE FILMS, INC., 113 NORTH SAN VINCENTE BLVD., BEVERLY HILLS, CA 90211 (10 for $20.00)
DESC	AUDIOVISUAL AIDS, FILMS, *INSTRUCTIONAL FILMS, INSTRUCTIONAL MATERIALS, *JOB INSTRUCTION, *MANAGEMENT, POST SECONDARY EDUCATION, *SUPERVISION, *TRAINING
DESC NOTE	23P. COMPANION FILM: "PATTERN FOR INSTRUCTION."

ABSTRACT PRESENTS THE FUNDAMENTALS OF JOB INSTRUCTION AND TRAINING FROM THE POINT OF VIEW OF BOTH THE LEARNER AND THE INSTRUCTOR. THE FOUR STEP METHOD DESCRIBED WILL GUIDE SUPERVISORS IN TEACHING BOTH NEW AND EXPERIENCED EMPLOYEES IN ANY JOB SITUATION. TEXT DETAILS HOW TO PREPARE TO INSTRUCT, HOW TO PRESENT THE JOB, HOW TO DEVELOP SKILLS BY LETTING PEOPLE ATTEMPT NEW TASKS AND THE PROPER WAY TO FOLLOW-UP, PROVIDE ENCOURAGEMENT AND ANSWER QUESTIONS.

INST NAME ROUNDTABLE FILMS, INC.

TITLE MOTIVATING FOR INCREASED PRODUCTIVITY.

PUB DATE 1975

AVAIL AMERICAN WATER WORKS ASSOCIATION, 6666 WEST QUINCY AVENUE, DENVER, CO 80235 ($5.00)

DESC *AUDIO-VISUAL AIDS, BEHAVIOR THEORIES, *INSTRUCTIONAL MATERIALS, INSTRUCTION, JOB SKILLS, MANAGEMENT, *MOTIVATION, *PRODUCTIVITY (WORKER), *PSYCHOLOGY, *SUPERVISION, *TRAINING, WORK ENVIRONMENT.

DESC NOTE 6P. AUDIOTAPE CASSETTES, 20 MINUTE LISTENING SESSIONS.

ABSTRACT ELEVEN UNITS ON MOTIVATION IN THE WORK ENVIRONMENT ARE PRESENTED IN THIS PACKET OF CASSETTE TAPES AND WORKBOOK. SITUATIONS ARE PRESENTED AND THEN ADDRESSED FROM VARIOUS POINTS OF VIEW TO HELP INDIVIDUALS STRENGTHEN THEIR MANAGERIAL SKILLS AND INCREASE AWARENESS OF PROBLEMS OF MOTIVATING SUBORDINATES. THIS SELF-PACED PROGRAM COVERS SUCH AREAS AS: PRINCIPLES OF MOTIVATION; MANAGING THE PSYCHOLOGICAL CONTRACT; MOTIVATING THROUGH TRAINING; AND FOSTERING SAFE ATTITUDES AND PERFORMANCE.

INST NAME AMERICAN MANAGEMENT ASSOCIATION

TITLE NEW AUDIO-VISUAL TRAINING PROGRAM FOR WASTEWATER TREATMENT PLANT OPERATORS.

PUB DATE 1978

AVAIL WATER POLLUTION CONTROL FEDERATION, 2626 PENNSYLVANIA AVE, NW, WASHINGTON, DC 20037

DESC *ACTIVATED SLUDGE, *ANAEROBIC DIGESTION, *CLARIFICATION, *DEWATERING, *DISINFECTION, *OPERATIONS (WASTEWATER), PRETREATMENT, *PUMPS, *SAFETY, *SLUDGE, SOLID WASTES, *TRAINING, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL

ABSTRACT THIS PROGRAM IS DESIGNED AS AN INTERMEDIATE COURSE FOR WASTEWATER TREATMENT PLANT OPERATORS. TOPICS COVERED INCLUDE: COMMUNITY WASTEWATER SYSTEMS,

	PRETREATMENT, CLARIFICATION, ACTIVATED SLUDGE, WASTE STABILIZATION PONDS, TRICKLING FILTERS, SLUDGE THICKENING, ANAEROBIC DIGESTION, AEROBIC DIGESTION, DEWATERING, WASTEWATER DISINFECTING, SAFETY, AND PUMPING. THE MATERIALS INCLUDE SLIDES, TAPE CASSETTES, STUDENT WORKBOOK, AND A PROGRAM ADMINISTRATOR HANDBOOK.
INST NAME	WATER POLLUTION CONTROL FEDERATION
TITLE	OPERATION OF WASTEWATER TREATMENT PLANTS, VOLUME I.
AUTHORS	KENNETH D. KERRI AND OTHERS
PUB DATE	1980
AVAIL	CALIFORNIA STATE UNIVERSITY AT SACRAMENTO, KENNETH D. KERRI, DEPARTMENT OF CIVIL ENGINEERING, 6000 "J" STREET, SACRAMENTO, CA 98519 ($20.00)
DESC	EQUIPMENT, *FACILITIES, *INSTRUCTIONAL MATERIALS, *OPERATIONS (WASTEWATER), *POST SECONDARY EDUCATION, SKILL DEVELOPMENT, *TEACHING GUIDES, *TEXTBOOKS, *TRAINING PROGRAMS, *WASTEWTER TREATMENT
DESC NOTE	450P
ABSTRACT	THIS MANUAL WAS ORIGINALLY DEVELOPED TO SERVE AS A HOME-STUDY COURSE BUT CONTINUED USE BY OPERATOR INSTRUCTORS PROVED ITS EFFECTIVENESS AS A TEXTBOOK IN THE CLASSROOM. THE PURPOSES OF THIS PROGRAM ARE: (1) TO DEVELOP QUALIFIED TREATMENT PLANT OPERATORS; (2) TO EXPAND THE ABILITIES OF EXISTING OPERATORS; AND (3) TO PREPARE OPERATORS FOR CERTIFICATION EXAMINATIONS. CHAPTER TITLES IN THIS VOLUME ARE: (1) THE TREATMENT PLANT OPERATOR; (2) WHY TREAT WASTES; (3) WASTEWATER TREATMENT FACILITIES; (4) RACKS, SCREENS, COMMINUTORS, AND GRIT REMOVAL; (5) SEDIMENTATION AND FLOTATION; (6) TRICKLING FILTERS; (7) ROTATING BIOLOGICAL CONTACTORS; (8) ACTIVATED SLUDGE; (9) WASTE TREATMENT PONDS; (10) DISINFECTION AND CHLORINATION. EACH CHAPTER BEGINS WITH AN INTRODUCTION AND THEN DISCUSSES START UP, DAILY OPERATION, INTERPRETATION OF LAB RESULTS AND POSSIBLE APPROACHES TO SOLVING OPERATIONAL PROBLEMS. AN INDEX, GLOSSARY, AND A FINAL EXAMINATION ARE ALSO INCLUDED.
TITLE	OPERATION OF WASTEWATER TREATMENT PLANTS, VOLUME II.
AUTHORS	KENNETH D. KERRI AND OTHERS

PUB DATE	1980
AVAIL	CALIFORNIA STATE UNIVERSITY AT SACRAMENTO, KENNETH D. KERRI, DEPARTMENT OF CIVIL ENGINEERING, 6000 "J" STREET, SACRAMENTO, CA 98519 ($20.00)
DESC	*INSTRUCTIONAL MATERIALS, LABORATORY PROCEDURES, MAINTENANCE, *MANAGEMENT, MATHEMATICS, *OPERATIONS (WASTEWATER), POST SECONDARY EDUCATION, RECORDS, SAFETY, SKILL DEVELOPMENT, *TEACHING GUIDES, *TEXTBOOKS, *TRAINING PROGRAMS, *WASTEWATER TREATMENT
DESC NOTE	630P
ABSTRACT	THIS MANUAL WAS ORIGINALLY DEVELOPED TO SERVE AS A HOME-STUDY COURSE BUT CONTINUED USE BY OPERATOR INSTRUCTORS PROVED ITS EFFECTIVENESS AS A TEXTBOOK IN THE CLASSROOM. THIS VOLUME STRESSES INFORMATION NEEDED BY OPERATORS OF LARGER CONVENTIONAL TREATMENT FACILITIES. THIS VOLUME WILL ALSO BE HELPFUL TO OPERATORS IN SUPERVISORY AND MANAGEMENT POSITIONS. CHAPTER TITLES IN THIS VOLUME ARE: (1) ACTIVATED SLUDGE; (2) SLUDGE DISGESTION AND SOLIDS HANDLING; (3) EFFLUENT DISPOSAL; (4) PLANT SAFETY AND GOOD HOUSEKEEPING, (5) MAINTENANCE; (6) LABORATORY PROCEDURES AND CHEMISTRY; (7) BASIC ARITHEMTIC AND TREATMENT PLANT PROBLEMS; (8) ANALYSIS AND PRESENTATION OF DATA; AND (9) RECORDS AND REPORT WRITING. AN INDEX, GLOSSARY, AND A FINAL EXAMINATION ARE ALSO INCLUDED.

TITLE	OPERATION OF WASTEWATER TREATMENT PLANTS, VOLUME III.
AUTHORS	KENNETH D. KERRI AND OTHERS
PUB DATE	1980
AVAIL	CALIFORNIA STATE UNIVERSITY AT SACRAMENTO, KENNETH D. KERRI, DEPARTMENT OF CIVIL ENGINEERING, 6000 "J" STREET, SACRAMENTO, CA 95819 ($20.00)
DESC	*FACILITIES, *INDUSTRIAL WASTES, *INSTRUCTIONAL MATERIALS, *OPERATIONS (WASTEWATER), *POST SECONDARY EDUCATION, SKILL DEVELOPMENT, *SOLID WASTES, *TEACHING GUIDES, *TEXTBOOKS, *TRAINING PROGRAMS, WASTE DISPOSAL, *WASTEWATER TREATMENT
DESC NOTE	870P
ABSTRACT	THIS MANUAL WAS ORIGINALLY DEVELOPED TO SERVE AS A HOME-STUDY COURSE BUT CONTINUED USE BY OPERATOR INSTRUCTORS PROVED ITS EFFECTIVENESS AS A TEXTBOOK IN THE CLASSROOM. THIS VOLUME CONTAINS INFORMATION FOR OPERATORS WITH ADVANCED WASTE TREATMENT PROCESSES, COMPLEX SOLIDS HANDLING AND DISPOSAL FACILITIES, AND INDUSTRIAL WASTES TO

TREAT. CHAPTER TITLES IN THIS VOLUME INCLUDE: (1) ODOR CONTROL; (2) ACTIVATED SLUDGE; (3) SOLIDS HANDLING AND DISPOSAL; (4) SOLIDS REMOVAL FROM SECONDARY EFFLUENTS; (5) PHOSPHORUS REMOVAL; (6) WASTEWATER RECLAMATION; (7) INSTRUMENTATION; (8) INDUSTRIAL WASTE MONITORING; (9) INDUSTRIAL WASTE TREATMENT; AND (10) SUPPORT SYSTEMS. AN INDEX, GLOSSARY, AND A FINAL EXAMINATION ARE ALSO INCLUDED.

TITLE	OPERATOR TRAINING WATER AND WASTEWATER WORKS OPERATIONS--BASIC.
PUB DATE	1968
AVAIL	OPERATOR TRAINING COMMITTEE OF OHIO, INC., P. O. BOX 626, WORTHINGTON, OH 43085 ($12.00)
DESC	*INSTRUCTIONAL MATERIALS, *JOB TRAINING, *LEARNING ACTIVITIES, MATHEMATICS, OHIO, *OPERATIONS (WASTEWATER), *OPERATIONS (WATER), *POST SECONDARY EDUCATION, *WASTEWATER TREATMENT, WATER TREATMENT
DESC NOTE	174P
ABSTRACT	THIS WORKBOOK WAS DESIGNED TO AID IN THE BASIC TRAINING OF WATER AND WASTEWATER WORKS OPERATORS. SECTIONS INCLUDE: TERMINOLOGY, MATHEMATICS REVIEW AND PLANT DATA, AND THEORY AND OPERATIONS. THESE SECTIONS CONTAIN A NUMBER OF ASSIGNMENTS APPLICABLE TO EACH TOPIC. EACH ASSIGNMENT CONTAINS A STATEMENT OF OBJECTIVES, A READING ASSIGNMENT, AND A SERIES OF QUESTIONS. ALSO INCLUDED IS A GLOSSARY AND A METRIC CONVERSION TABLE.

TITLE	PATTERN FOR INSTRUCTION.
AVAIL	ROUNDTABLE FILMS, INC., 113 NORTH SAN VINCENTE BLVD., BEVERLY HILLS, CA 90211 ($65.00)
DESC	AUDIOVISUAL AIDS, *FILMS, INSTRUCTIONAL FILMS, *INSTRUCTIONAL MATERIALS, JOB INSTRUCTION, *MANAGEMENT, POST SECONDARY EDUCATION, *SUPERVISION, *TRAINING
DESC NOTE	16MM, 21 MIN, COLOR; MANAGER'S GUIDEBOOK "JOB INSTRUCTION: THE COMMUNICATION OF ABILITY" RECOMMENDED
ABSTRACT	RELATES THE BASIC STEPS IN JOB INSTRUCTION TRAINING TO THE PRINCIPLES OF LEARNING. ENCOURAGES A MORE POSITIVE ATTITUDE TOWARD THE SUPERVISOR'S TRAINING JOB.

TITLE	PERFORMANCE-BASED ADULT VOCATIONAL EDUCATION.
AUTHORS	DOUGLAS S. PATTERSON AND OTHERS
PUB DATE	14 APR 78
AVAIL	ED 164 795 - MF01 PLUS POSTAGE
DESC	ADULT EDUCATORS, ADULT STUDENTS, *ADULT VOCATIONAL EDUCATION, DATA ANALYSIS, EDUCATIONAL OBJECTIVES, *INSERVICE TEACHER EDUCATION, *INSTRUCTIONAL SYSTEMS, MODELS, PARTICIPANT SATISFACTION, *PERFORMANCE BASED EDUCATION, PROGRAM DESIGN, *PROGRAM DEVELOPMENT, PROGRAM EVALUATION
DESC NOTE	140P
ABSTRACT	A PROJECT WAS CONDUCTED TO DEVELOP AN ADULT VOCATIONAL EDUCATION COMPETENCY-BASED PROGRAM USING A RESEARCH-BASED INSTRUCTIONAL SYSTEMS DESIGN AND TO ASSESS THE APPLICATION OF COMPETENCY-BASED RESEARCH PRODUCTS BEING DEVELOPED BY THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES IN THE DEVELOPMENT OF ADULT VOCATIONAL EDUCATION PROGRAMS.
INST NAME	ALABAMA STATE DEPARTMENT OF EDUCATION, MONTGOMERY. DIVISION OF VOCATIONAL EDUCATION

TITLE	PLAN FOR ENVIRONMENTAL/ENERGY EDUCATION IN THE PUBLIC COMMUNITY COLLEGE SYSTEM OF ILLINOIS, A.
PUB DATE	1975
	ED 153 791 - MF01/PC06 PLUS POSTAGE
DESC	AIR POLLUTION CONTROL, *CURRICULUM DEVELOPMENT, *ENVIRONMENTAL EDUCATION, *ENVIROMENTAL TECHNICIANS, *HIGHER EDUCATION, JUNIOR COLLEGES, PESTICIDES, WATER POLLUTION CONTROL
DESC NOTE	135P
ABSTRACT	THIS REPORT EXAMINES THE ENVIRONMENTAL TRAINING EFFORTS OF COMMUNITY COLLEGES IN ILLINOIS. THE TEXT INCLUDES A SERIES OF NINE MODEL ENVIRONMENTAL PROTECTION CURRICULA AND OUTLINES APPROPRIATE COURSE DESCRIPTIONS FOR POLLUTION CONTROL AND ABATEMENT, RADIATION, AND GENERAL ENVIRONMENTAL TECHNOLOGY. A FINAL SECTION OFFERS RECOMMENDATIONS WHICH ADDRESS EXISTING AND FUTURE ENVIROMENTAL CONCERNS AND THEIR RELATIONSHIP TO HIGHER EDUCATION.
INST NAME	NATIONAL FIELD RESEARCH CENTER INC., IOWA CITY, IOWA.

TITLE	PROCEEDINGS OF THE NATIONAL WORKSHOP ON COMPETENCY-BASED ADULT VOCATIONAL INSTRUCTION, AUGUST 2-5, 1977. LEADERSHIP TRAINING SERIES NO. 55.
AUTHORS	EARL B. RUSSELL AND OTHERS

PUB DATE	JAN 78
AVAIL	NATIONAL CENTER FOR RESEARCH IN VOCATIONAL EDUCATION PUBLICATIONS, OHIO STATE UNIVERSITY, 1960 KENNY ROAD, COLUMBUS, OH 43210 ($12.25) - ED 153 052 - MF01/PC09 PLUS POSTAGE
DESC	*ADULT EDUCATION PROGRAMS, *ADULT VOCATIONAL EDUCATION, DEMONSTRATION PROGRAMS, EDUCATIONAL PRACTICE, EDUCATIONAL RESOURCES, INFORMATION DISSEMINATION, *PERFORMANCE BASED EDUCATION, *PROGRAM DESCRIPTIONS, *WORKSHOPS
DESC NOTE	217P
ABSTRACT	THE PURPOSE OF THE WORKSHOP REPORTED HERE WAS (1) TO SHARE AND EXCHANGE INFORMATION FROM A NATIONAL SURVEY OF THE STATUS OF COMPENTENCY-BASED ADULT VOCATIONAL EDUCATION INSTRUCTION AND (2) TO ASSIST THE PARTICIPANTS IN IMPLEMENTING OR EXPANDING COMPETENCY-BASED PROGRAMS.
INST NAME	OHIO STATE UNIVERSITY, COLUMBUS, NATIONAL CENTER FOR RESEARCH IN VOCATION AL EDUCATION.

TITLE	REPORT ON THE APPLICATION OF WORKFORCE PLANNING METHODOLOGY IN THE CUYAHOGA COUNTY SANITARY ENGINEERS OPERATIONS AND MAINTENANCE SECTIONS.
PUB DATE	APR 80
AVAIL	MICHAEL G. KORDIC, RESEARCH ASSOCIATE, CUYAHOGA COMMUINITY COLLEGE, 2900 COMMUNITY COLLEGE AVENUE, CLEVELAND, OH 44115
DESC	*ADMINISTRATION, CHEMISTS, CAREER LADDERS, *ENGINEERS, *MANPOWER NEEDS, *MAINTENANCE, *OPERATIONS, OCCUPATIONAL TITLES, OPERATIONS (WASTEWATER TREATMENT), *PERSONNEL NEEDS, *PLANNING, *SEWERS, *SANITARY ENGINEERING, *TECHNICIANS, *TRAINING, *WASTEWATER TREATMENT
DESC NOTE	46P
ABSTRACT	THIS REPORT CONTAINS A DESCRIPTION OF THE MANPOWER PLANNING PROCESS AS DEVELOPED BY THE WORKFORCE PLANNING ASSOCIATES OF MCLEAN, VIRGINIA AND USED BY THE CUYAHOGA COUNTY SANITARY ENGINEER'S OPERATIONS AND MAINTENANCE SECTIONS. THE PURPOSE OF THE PROJECT WAS TO DETERMINE THE EMPLOYMENT AND TRAINING NEEDS FOR THE DEPARTMENT. IT ALSO DETERMINED SELECTED CHARACTERISTICS OF CURRENT AND EXPECTED EMPLOYMENT. IT DEMONSTRATED A PROCESS FOR IDENTIFYING NEEDS AND MANPOWER PLANNING METHODOLOGY FOR MEETING THEM.

TITLE	SELECTED MODELS AND ELEMENTS OF EVALUATION FOR VOCATIONAL EDUCATORS.
AUTHORS	DONALD C. ORLICH AND RONALD R. MURPHY

PUB DATE	MAR 79
AVAIL	ED 190 742 - MF01/PC05 PLUS POSTAGE
DESC	ACHIEVEMENT GAINS, DATA COLLECTION, *EVALUATION CRITERIA, *EVALUATION METHODS, *MODELS, POST SECONDARY EDUCATION, PROGRAM EFFECTIVENESS, *PROGRAM EVALUATION, SECONDARY EDUCATION, *VOCATIONAL EDUCATION
DESC NOTE	106P
ABSTRACT	THE PURPOSE OF THIS MANUAL IS TO PROVIDE VOCATIONAL EDUCATORS WITH EVALUATION ELEMENTS AND TESTED MODELS WHICH CAN ASSIST THEM IN DESIGNING EVALUATION SYSTEMS.
INST NAME	WASHINGTON STATE COMMISSION FOR VOCATIONAL EDUCATION, OLYMPIA.

TITLE	SO YOU'RE HELPING ADULTS LEARN.
PUB DATE	AUG 78
AVAIL	ED 174 807 - MF01/PC01 PLUS POSTAGE
DESC	*ADULT BASIC EDUCATION, ADULT CHARACTERISTICS, *ADULT EDUCATION, ADULT LEARNING, ADULT STUDENTS, AGE DIFFERENCES, BEHAVIORAL OBJECTIVES, LESSON PLANS, PROGRAM DEVELOPMENT, *PROGRAM PLANNING, *TEACHING TECHNIQUES
DESC NOTE	25P
ABSTRACT	THIS BOOKLET WAS DEVELOPED TO PROVIDE A BRIEF REVIEW OF ADULT CHARACTERISTICS AND TEACHING METHODS FOR THE NEW TEACHER OF ADULTS.
INST NAME	WISCONSIN STATE BOARD OF VOCATIONAL, TECHNICAL, AND ADULT EDUCATION, MADISON.

TITLE	STAFF DEVELOPMENT: TEACHING ADULT PROFESSIONALS.
AUTHORS	SARA R. MASSEY
PUB DATE	19 JAN 78
AVAIL	NEW ENGLAND TEACHER CORPS NETWORK, P. O. BOX 550, DURHAM, NH 03824 ($2.50) - ED 148 773 - MF01/PC01 PLUS POSTAGE
DESC	ADULT CHARACTERISTICS, *ADULT LEARNING, *ADULT STUDENTS, BEHAVIOR PATTERNS, *LEARNING PROCESSES, *PROFESSIONAL CONTINUING EDUCATION, TEACHER ROLE, *TEACHING TECHNIQUES, WORKSHOPS
DESC NOTE	13P
ABSTRACT	MOST TEACHERS OF ADULT PROFESSIONALS HAVE BEEN TEACHERS OF A YOUNGER STUDENT POPULATION. THE CHARACTERISTICS OF ADULT LEARNERS AND THEIR LEARNING PROCESS NECESSITATES OTHER CONSIDERATIONS IN THE DESIGNING OF LEARNING EXPERIENCES.

TITLE	STATE PROGRAM DESCRIPTIONS OF WASTEWATER AND DRINKING WATER OPERATOR TRAINING.
AUTHORS	LORRAINE C. KOSID
PUB DATE	AUG 79
AVAIL	REGIONAL WORKFORCE SPECIALIST, U.S. ENVIRONMENTAL PROTECTION AGENCY, PERSONNEL AND MANPOWER DEVELOPMENTAL BRANCH, 230 S. DEARBORN ST., CHICAGO, IL 60604 (FREE)
DESC	DIRECTORIES, *ENVIRONMENTAL TECHNICIANS, JOB SKILLS, *MANPOWER DEVELOPMENT, PROFESSIONAL DEVELOPMENT, *POST SECONDARY EDUCATION, *PROGRAM DESCRIPTIONS, *STATE PROGRAMS, *TRAINING, *WASTEWATER TREATMENT, *WATER TREATMENT, *WATER POLLUTION CONTROL
DESC NOTE	110P
ABSTRACT	THIS DOCUMENT CONTAINS PROGRAM DESCRIPTIONS OF WASTEWATER AND DRINKING WATER OPERATOR TRAINING OPPORTUNITIES WITHIN THE SIX STATE AREA OF ILLINOIS, INDIANA, MICHIGAN, MINNESOTA, OHIO, AND WISCONSIN. THE PROGRAMS DISCUSS BOTH PRE-SERVICE AND IN-SERVICE OPPORTUNITIES INCLUDING: PLANT OPERATION; LABORATORY, INSTRUCTOR, AND MANAGEMENT TRAINING; AND INDIVIDUALIZED COURSES.

TITLE	STUDY OF JOB DEMANDS AND CURRICULUM DEVELOPMENT IN AGRICULTURAL TRAINING RELATED TO THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM, A. FINAL REPORT. VOLUME I. AN OVERVIEW OF THE RESEARCH PROJECT.
AUTHORS	HAROLD S. FISHER AND OTHERS
PUB DATE	JAN 76
AVAIL	ED 137 544 - MF01/PC05 PLUS POSTAGE
DESC	AGRICULTURAL EDUCATION, AGRICULTURAL RESEARCH PROJECTS, BEHAVIORAL OBJECTIVES, *CURRICULUM DEVELOPMENT, EMPLOYMENT PROJECTIONS, FARM OCCUPATIONS, *JOB SKILLS, JOB TRAINING, JUNIOR COLLEGES, LAND USE, LEARNING MODULES, *MANPOWER NEEDS, MATERIAL DEVELOPMENT, OFF FARM AGRICULTURAL OCCUPATIONS, PROGRAM DESCRIPTIONS, PROGRAM DEVELOPMENT, RESEARCH, SECONDARY EDUCATION, SURVEYS, TASK ANALYSIS, *VOCATIONAL DEVELOPMENT, *WASTE DISPOSAL, *WATER POLLUTION CONTROL, WATER RESOURCES
DESC NOTE	115P
ABSTRACT	THIS VOLUME IS ONE OF A FOUR-VOLUME FINAL REPORT OF A RESEARCH PROJECT DEVELOPED TO IDENTIFY THE JOBS AND TRAINING NEEDS FOR THE AREA OF WASTEWATER LAND TREATMENT SYSTEMS AND RELATED AGRICULTURAL OCCUPATIONS.

INST NAME	MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT, MICH.

TITLE	TERTIARY TEACHERS LEARNING ABOUT LEARNING: A CASE STUDY OF CONSTRAINTS AND OPPORTUNITIES. TERC RESEARCH AND DEVELOPMENT PAPER NO. 49.
AUTHORS	J. P. POWELL
PUB DATE	OCT 77
AVAIL	ED 175 334 - MF01 PLUS POSTAGE
DESC	ADULT EDUCATION, *ADULT LEARNING, COLLEGE FACULTY, *COURSE EVALUATION, *EDUCATION COURSES, FOREIGN COUNTRIES, HEALTH OCCUPATIONS EDUCATION, HIGHER EDUCATION, *LEARNING PROCESSES, MASTERS DEGREES, STUDENT EVALUATION OF TEACHER PERFORMANCE, *TEACHER EDUCATION, TEACHER INFLUENCE
DESC NOTE	34P
ABSTRACT	A CASE STUDY IS PRESENTED OF A COURSE FOR EXPERIENCED TERTIARY TEACHERS AT THE UNIVERSITY OF NEW SOUTH WALES. THE COURSE, "LEARNING AND TEACHING," WAS A COMPULSORY PART OF A MASTERS PROGRAM FOR THOSE INVOLVED IN TEACHING THE HEALTH PROFESSIONS.
INST NAME	NEW SOUTH WALES UNIVERSITY, KENSINGTON (AUSTRALIA). TERTIARY EDUCATION RESEARCH CENTRE.

TITLE	TRAINING FOR OPERATION AND MAINTENANCE OF CHLORINATION EQUIPMENT.
AUTHORS	FRED DELVECCHIO AND ED HARTMANN
PUB DATE	AUG 80
AVAIL	WASHINGTON ENVIROMENTAL TRAINING RESOURCE CENTER, GREEN RIVER COMMUNITY COLLEGE, AUBURN, WA 98002
DESC	*CHLORINATION, *DISINFECTION, *EQUIPMENT, *INSTRUCTIONAL MATERIALS, *MAINTENANCE, *OPERATIONS (WASTEWATER), *TRAINING, *TRAINING MATERIALS, *WASTEWATER TREATMENT
DESC NOTE	10P
ABSTRACT	THIS PRESENTATION DESCRIBES HOW THE WASHINGTON ENVIROMENTAL TRAINING RESOURCE CENTER AT GREEN RIVER COMMUNITY COLLEGE USED A SYSTEMATIC INSTRUCTIONAL DEVELOPMENT PROCESS TO PUT TOGETHER A COURSE FOR OPERATION AND MAINTENANCE OF CHLORINATION EQUIPMENT. IT DESCRIBES OTHER TRAINING COURSES AND HOW THESE PAST PROGRAMS WERE INVOLVED IN FORMULATING OR DEVELOPING THE GREEN RIVER TRAINING COURSE. IT ALSO SUGGESTS HOW THE COURSE COULD BE FURTHER DEVELOPED AND REFINED IN THE FUTURE.

TITLE	TROUBLESHOOTING O & M PROBLEMS IN WASTEWATER TREATMENT FACILITIES. INSTRUCTOR NOTEBOOK.
PUB DATE	AUG 76
AVAIL	NATIONAL TECHNICAL INFORMATION SERVICE, 5285 PORT ROYAL ROAD, SPRINGFIELD, VA 22161 ($19.00)
DESC	BEHAVIORAL OBJECTIVES, BIOLOGICAL TREATMENT, *ENVIRONMENTAL TECHNICIANS, EQUIPMENT, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *MAINTENANCE, *OPERATIONS (WASTEWATER), *POST SECONDARY EDUCATION, SEDIMENTATION BASINS, SLUDGE, STAFFING, WASTE DISPOSAL, *WASTEWATER TREATMENT, WATER POLLUTION CONTROL
DESC NOTE	672P
ABSTRACT	THIS DOCUMENT CONTAINS THE INSTRUCTOR GUIDELINES FOR A COURSE ON OPERATION AND MAINTENANCE PROBLEMS IN WASTEWATER TREATMENT PLANTS. EACH LESSON PLAN MODULE CONTAINS: (1) A SET OF INSTRUCTIONS; (2) LESSON OUTLINE; (3) VISUAL AIDS; (4) NOTEBOOK MATERIALS; (5) HANDOUTS; AND (6) GUIDELINES ON THE APPROACH TO THE LESSON. FOR EACH LESSON THE INSTRUCTOR IS PROVIDED WITH A SET OF BEHAVIORAL OBJECTIVES, PRESENTATION OPTIONS, AND SUGGESTED TEST QUESTIONS. LESSON TOPICS INCLUDE: (1) SCREENING AND COMMUNICATION; (2) SEDIMENTATION BASINS; (3) BIOLOGICAL TREATMENT UNITS; (4) SLUDGE CONDITIONING, DEWATERING, AND DISPOSAL; (5) EQUIPMENT; AND (6) STAFFING.
INST NAME	AMERICAN PUBLIC WORKS ASSOCIATION

TITLE	UTILIZATION OF GROUNDED THEORY TO IDENTIFY INSTRUCTIONAL DESIGN ELEMENTS IN ADULT EDUCATION PROGRAMS, THE.
AUTHORS	ROBERT L. LA GOW
PUB DATE	APR 77
AVAIL	ED 145 074 - MF01/PC02 PLUS POSTAGE
DESC	*ADULT EDUCATION PROGRAMS, EDUCATIONAL ENVIRONMENT, EDUCATIONAL PRACTICE, EDUCATIONAL RESEARCH, EDUCATIONAL STRATEGIES, *EDUCATIONAL THEORIES, FIELD STUDIES, *INSTRUCTIONAL DESIGN, *INSTRUCTIONAL SYSTEMS, *MODELS, PROGRAM ADMINSTRATION, PROGRAM DEVELOPMENT, PROGRAM PLANNING, STUDENT SCHOOL RELATIONSHIP, STUDENT TEACHER RELATIONSHIP
DESC NOTE	39P. PAPER PRESENTED TO THE ADULT EDUCATION RESEARCH CONFERENCE (MINNEAPOLIS, MINNESOTA, APRIL 20, 1977)

ABSTRACT A STUDY WAS DONE TO DISCOVER AND GENERATE THEORY OF INSTRUCTIONAL DESIGN BASED ON PROCEDURES CURRENTLY USED IN SELECTED ADULT EDUCATION AGENCIES.

TITLE VOCATIONAL TEACHER EDUCATION: A REVIEW OF THE RESEARCH. INFORMATION SERIES NO. 185.
AUTHORS RICHARD A. ADAMSKY AND CALVIN J. COTRELL
PUP DATE 1979
AVAIL NATIONAL CENTER PUBLICATIONS, NATIONAL CENTER FOR RESEARCH IN VOCATIONAL EDUCATION, THE OHIO STATE UNIVERSITY, 1960 KENNY ROAD, COLUMBUS, OH 43210 ($2.80) - ED 179 769 - MF01/PC02 PLUS POSTAGE.
DESC FINANCIAL SUPPORT, JOB SKILLS, *PERFORMANCE BASED TEACHER EDUCATION, PERSONNEL NEEDS, RESEARCH PROJECTS, STATE AID, SYSTEMS DEVELOPMENT, TASK ANALYSIS, *TEACHER RECRUITMENT, *TEACHING EXPERIENCE, *TRAINING TECHNIQUES, *VOCATIONAL EDUCATION TEACHERS
DESC NOTE 44P
ABSTRACT RESEARCH LITERATURE WAS REVIEWED FOR THE JOINT PURPOSES OF ASSESSING THE STATE OF THE ART IN VOCATIONAL TEACHER EDUCATION RESEARCH AND ATTEMPTING TO DETERMINE WHETHER VOCATIONAL TEACHER EDUCATION HAS ESCAPED ITS ANCILLARY STATUS AND, THROUGH SIGNIFICANT RESEARCH, MOVED TOWARD BECOMING AN INTELLECTUAL FIELD.
INST NAME ERIC CLEARINGHOUSE ON ADULT, CAREER, AND VOCATIONAL EDUCATION, COLUMBUS, OH

TITLE WATER: HOW GOOD IS GOOD ENOUGH? TEACHER'S GUIDE. SOCIAL STUDIES MODULE (9TH-10TH GRADE SOCIAL STUDIES).
PUB DATE 1977
AVAIL ED 156 486 - MF01/PC02 PLUS POSTAGE
DESC CONSERVATION EDUCATION, *CURRICULUM GUIDES, *ENVIRONMENTAL EDUCATION, POLLUTION, SCIENCE EDUCATION, *SECONDARY EDUCATION, *SOCIAL SCIENCES, *TEACHING GUIDES, WASTE DISPOSAL, WATER POLLUTION CONTROL, *WATER RESOURCES
DESC NOTE 40P
ABSTRACT THIS TEACHER'S GUIDE IS FOR AN ENVIRONMENTAL EDUCATION MODULE TO INTEGRATE TOPICS OF WATER QUALITY NINTH- AND TENTH-GRADE SOCIAL STUDIES CLASSES.
GEORGIA UNIVERSITY, ATHENS. COLLEGE OF EDUCATION.

TITLE WATER PLANT OPERATOR INTERMEDIATE COURSE.
HORACE FRYE

PUB DATE	DEC 74
AVAIL	ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF PUBLIC WATER SUPPLIES, SPRINGFIELD, IL 62706
DESC	BEHAVIORAL OBJECTIVES, CHEMISTRY, *CURRICULUM GUIDES, *INSTRUCTIONAL MATERIALS, JOB SKILLS, *LABORATORY TECHNIQUES, *POST SECONDARY EDUCATION, WATER POLLUTION CONTROL, *WATER QUALITY, *ILLINOIS, *OPERATIONS (WATER), *WATER TREATMENT
DESC NOTE	43P
ABSTRACT	THIS DOCUMENT PROVIDES A GENERAL OUTLINE AND THE NOTES FOR A 12 SESSION COURSE DESIGNED FOR ENVIRONMENTAL TECHNICIANS INVOLVED WITH WATER TREATMENT PLANT OPERATIONS. EACH SESSION IS DESIGNED TO LAST TWO AND ONE-HALF HOURS COVERING SUCH TOPICS AS PRETREATMENT, FILTER OPERATION AND CONTROL, WATER SOFTENING, LABORATORY TECHNIQUES, AND TASTE AND ODOR CONTROL.

TITLE	WATERBORNE DISEASE CONTROL. MUNICIPAL WATER TREATMENT, LESSON 7. HOMESTUDY COURSE 3014-G.
PUB DATE	1979
AVAIL	DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE, CENTER FOR DISEASE CONTROL, ATLANTA, GA 30333 ($13.00 FOR ENTIRE SET OF 11 LESSONS).
DESC	*DISEASE CONTROL, HOME STUDY, *INSTRUCTIONAL MATERIALS, *INDIVIDUALIZED INSTRUCTION, *MUNICIPALITIES, PUBLIC HEALTH, *POST SECONDARY EDUCATION, *SANITATION, *TRAINING PROGRAMS, UTILITIES, *WATER TREATMENT, WATER POLLUTION CONTROL
DESC NOTE	9P
ABSTRACT	THIS DOCUMENT IS ONE IN A SERIES OF HOME STUDY LESSONS WHICH ARE PART OF A COURSE ON DISEASE CONTROL FOR THE SANITARIAN. EACH LESSON CONTAINS THREE CATEGORIES OF REFERENCES TO ASSIST THE STUDENT. PRIMARY REFERENCES ARE REQUIRED READING, REVIEW REFERENCES PROVIDE ADDITIONAL INFORMATION, AND SUPPLEMENTARY REFERENCES PROVIDE DETAILED COVERAGE OF THE SUBJECT MATTER. EACH LESSON CONTAINS A 25 QUESTION MULTIPLE-CHOICE TEST, A 25 QUESTION TRUE-FALSE TEST, AND AN ANSWER SHEET. THIS LESSON, NUMBER SEVEN, DISCUSSES MUNICIPAL WATER TREATMENT.
INST NAME	CENTER FOR DISEASE CONTROL. BUREAU OF TRAINING, HOMESTUDY COURSE.

TITLE	WELCOME ABOARD: LEARNING MATERIALS PACKAGE.
AVAIL	ROUNDTABLE FILMS, INC., 113 NORTH SAN VINCENTE BLVD., BEVERLY HILLS, CA 90211 ($20.00).
DESC	AUDIOVISUAL AIDS, *COMMUNICATIONS, *INSTRUCTIONAL MATERIALS, *LEADERSHIP, *MANAGEMENT, POST SECONDARY EDUCATION, *SUPERVISION, *TRAINING
DESC NOTE	INCLUDES ONE SESSION PLANNER, 50 STUDY GUIDES, AND ONE POSTER. COMPANION FILM: "WELCOME ABOARD".
ABSTRACT	LEARNING AIDS TO HELP MAKE TRAINING SESSIONS MORE EFFECTIVE, MORE ENJOYABLE, AND EASIER.
INST NAME	ROUNDTABLE FILMS, INC.

EPA INSTRUCTIONAL RESOURCES CENTER

EPA INSTRUCTIONAL RESOURCES CENTER

The EPA Instructional Resources Center (IRC) acquires, reviews, indexes, and makes available both print and non-print materials related to water quality and water resources education and instruction. Activities of the IRC include:

IRIS

The focal point of the IRC is the Instructional Resources Information System (IRIS), a compilation of abstracts on print and non-print materials related to water quality and water resources education. Obtainable in paper, microfiche, and computer versions, the IRIS contains more than 5,500 entries from local, state, and federal government sources, as well as from private concerns and educational institutions. The system allows the user to discover what material can be utilized, the title, the author, cross references, and a brief abstract describing the content. IRIS users can also readily determine where the material can be obtained, whether it can be purchased, borrowed, or rented, and the cost. The IRIS is kept current through constant revision, adding new material as it becomes available and deleting outdated information.

IRIS can be scanned for a particular subject or author, both by hand and by computer. Any institution with appropriate computer terminals can access the search and retrieval capabilities of the system.

Audiovisual Library

The IRC facilities include an audiovisual library equipped with individual study carrels for viewing movies, videocassettes, slide/tape presentations, filmstrips, and tape programs. Before determining curriculum requirements or making purchases, educators can use the library to review water quality-oriented materials for use in training courses.

Nearly 200 of these audiovisuals are also available to instructors for rental. Not intended as self-instructional units, these materials are meant to be used as part of a complete training program. A catalog of audiovisual units can be obtained through the IRC.

Workshops

The center also conducts a variety of water-related workshops each year. Designed for state and local agencies, as well as college and university educators, these seminars enable individuals to become familiar with USEPA developed and sponsored resources, descriptions of ongoing programs, and specific instructional techniques.

IRC Bulletin

The IRC maintains communications with its users through the IRC Bulletin. Published six times a year and mailed to interested parties at a small charge, the Bulletin provides current news on IRC events. It also includes descriptions of model programs, current instructional materials available, and education strategies. Articles for the Bulletin are accepted from various organizations, education institutions, and governmental agencies.

THE INSTRUCTIONAL RESOURCES INFORMATION SYSTEM

General Information about Materials in IRIS

The EPA Instructional Resources Center acquires, reviews, indexes, and makes available both print and non-print materials related to water quality and water resources education and instruction.

Before materials are entered into IRIS they are reviewed by the project staff. Availability of the material is checked, and the materials are abstracted and indexed. The abstract describes the contents of the material.

When items are processed they are entered on the IRIS computer tape maintained by the EPA Instructional Resources Center at The Ohio State University. These tapes are used for producing tapes for other information systems, publications, and for computer searches conducted at The Ohio State University.

Materials entered into the IRIS collection can be located by manual search or by computer. The first compilation contains resumes of selected materials processed for the previous IRIS collection and resumes of selected materials of items added to the IRIS collection during 1979. Quarterly updates of the IRIS compilation are available by subscription on a yearly basis.

A number of the materials processed for the IRIS system are entered into the ERIC system and announced in Resources in Education (RIE). Most of the materials announced in RIE are available on microfiche at various sites throughout the United States. Users can view these materials on site at many locations to identify what they believe will be useful to them at no cost.

Description of Information in Resumes in IRIS

Two samples of resumes are provided to explain the data fields in the resumes. Sample resume #1 is a sample resume of an item not entered in ERIC. Sample resume #2 is a sample resume of an item entered into ERIC; a few additional data elements are in these resumes and are explained.

1. Sample resume of materials not entered into ERIC

   a. IRIS NUMBER: EW003059
   b. PUBLICATION DATE: 1978
   c. TITLE: WATER POLLUTION MICROBIOLOGY, VOL. 2
   d. PERSONAL AUTHOR: MITCHELL, RALPH
   e. DESCRIPTOR: BIOCHEMISTRY; *COLLEGE SCIENCE; DISEASE CONTROL; ECOLOGY; *ENVIRONMENTAL INFLUENCES; *INSTRUCTIONAL MATERIALS; *MICROBIOLOGY; NATURAL RESOURCES; *POLLUTION; *PUBLIC HEALTH; *WATER POLLUTION CONTROL; WATER QUALITY
   f. DESCRIPTIVE NOTE: 442P.
   g. ABSTRACT: THIS VOLUME CONTAINS INFORMATION FOR ENVIRONMENTAL AND SANITARY ENGINEERS, PUBLIC HEALTH SCIENTISTS AND MICROBIOLOGISTS CONCERNED WITH WATER POLLUTION. IT EXAMINES MICROORGANISMS AS CAUSITIVE AGENTS OF ECOLOGICAL AND PUBLIC HEALTH HAZARDS IN NATURAL WATERS, AND TREATS THE USE OF MICROORGANISMS IN POLLUTION CONTROL FROM A VARIETY OF PERSPECTIVES. (CS)
   h. AVAILABILITY: JOHN WILEY & SONS, ONE WILEY DR., SOMERSET NJ 08873 ($24.95)

   a. IRIS NUMBER--this is the identification number sequentially assigned to materials as they are processed. Gaps in numbers mean that some items have been deleted, are being processed to add new information, or have been delayed in processing for some reason.

   b. PUBLICATION DATE--date material was published according to information on the material.

   c. TITLE

   d. PERSONAL AUTHOR--person or persons who wrote, compiled, or edited the material. Up to two personal authors can be listed.

   e. DESCRIPTOR--subject terms which characterize substantive contents and form of the materials. The major terms are preceded by an asterisk. Terms used to index all resumes in this compilation can be reviewed in the Subject Index.

   f. DESCRIPTIVE NOTE--various items of information may be contained in this section. For print materials the number of pages is usually listed.

g. ABSTRACT--some early materials entered into IRIS did not have abstract information. All materials currently being entered into IRIS have an informative abstract that describes the contents of the item.

h. AVAILABILITY--information in this field indicates where the material can be obtained and the price of the material quoted the last time information was received from the source. Please note: prices of nearly all materials are subject to changes and may not be accurate at the time a person orders a specific item.

2. Sample resume of material entered into ERIC (Resources in Education)

Item entered into ERIC (Resources in Education) will have a few additional data fields.

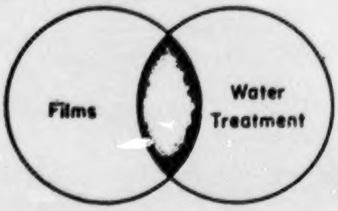
IRIS NUMBER: EW002998
a. ERIC NUMBER: ED151236
PUBLICATION DATE: SEP 77
TITLE: CHLORINATION. TRAINING MODULE 2.300.2.77.
INSTITUTION CODE: BBB08399
SPONSORING AGENCY CODE: BBB15379; FGK21436
DESCRIPTOR: *CHEMISTRY; *INSTRUCTIONAL MATERIALS; *POST SECONDARY EDUCATION; SECONDARY EDUCATION; *TEACHING GUIDES; *UNITS OF STUDY; WATER POLLUTION CONTROL; *CHLORINATION; *WASTE WATER TREATMENT; WATER TREATMENT
b. EDRS PRICE: EDRS PRICE MF-$0.83 HC-$3.50 PLUS POSTAGE
DESCRIPTIVE NOTE: 60P. FOR RELATED DOCUMENTS, SEE SE024 025-046
c. ISSUE: RIEJUL78
ABSTRACT: THIS DOCUMENT IS AN INSTRUCTIONAL MODULE PACKAGE PREPARED IN OBJECTIVE FORM FOR USE BY AN INSTRUCTOR FAMILIAR WITH CHLORINE. THE REASONS FOR CHLORINATION AND SAFE OPERATION AND MAINTENANCE OF GAS CHLORINE, DRY CALCIUM, HYPOCHLORITE AND LIQUID SODIUM HYPOCHLORITE CHLORINATION SYSTEMS FOR WATER SUPPLY AND WASTEWATER TREATMENT FACILITIES ARE GIVEN. INCLUDED ARE OBJECTIVES, INSTRUCTOR GUIDES, STUDENT HANDOUTS AND TRANSPARENCY MASTERS. THE MODULE CONSIDERS PURPOSES OF CHLORINATION, PROPERTIES OF CHLORINE, METHODS OF CHLORINATION, SAFETY, MAINTENANCE OF CHLORINATION UNITS AND INTERPRETATION OF TEST RESULTS. (AUTHOR/RH)
d. INSTITUTION NAME: KIRKWOOD COMMUNITY COLL., CEDAR RAPIDS, IOWA.
SPONSORING AGENCY NAME: DEPARTMENT OF LABOR, WASHINGTON, D.C.; IOWA STATE DEPT. OF ENVIRONMENTAL QUALITY, DES MOINES.

How to Locate Desired Materials in IRIS

Users can identify materials of interest by scanning the resume listing, or using the Subject Index, Author Index, or Institution Index in the IRIS Compilation.

The Subject Index is designed to enable the user to search for information on either a broad subject or a narrow information concern. An EW number is included for each item listed under the subject heading. The EW number refers to the abstract entry in the resume section where complete bibliographic information, an abstract of the item, and availability information can be found.

A user can also coordinate a search by checking EW numbers that appear under two or more subject headings. For example, you could check all the EW numbers under Water Treatment and all the EW numbers under Films. EW numbers included under both subject headings would include information relevant to Water Treatment that were films. EW numbers under wastewater treatment and laboratory techniques would provide a list of materials related to laboratory techniques and to wastewater treatment. Similar techniques could be used to identify other information desired.



If you desire to locate a document by the name of the author, you can use the Author Index. EW numbers are provided under the author in the Author Index as in the Subject Index. Some documents do not have a listed author. These documents are listed under the name of the institution or organization responsible for developing the document in the Institution Index. Both sources can be used to help you locate documents.

The ERIC System

Another excellent source of educational information and materials is the ERIC system. ERIC is a national information system designed and developed by the U.S. Office of Education, and now supported and operated by the National Institute of Education (NIE), for providing ready access to descriptions of exemplary programs, research, instructional materials, teaching guides, and other related information that can be used to develop effective educational programs.

ERIC Clearinghouses

There are 16 clearinghouses in the nationwide ERIC network. Each clearinghouse has responsibility for collecting and analyzing materials related to their scope.

ADULT, CAREER, AND VOCATIONAL EDUCATION
The Ohio State University
Center for Vocational Education
1960 Kenny Road
Columbus, Ohio 43210
(614) 486-3655

COUNSELING AND PERSONNEL SERVICES
University of Michigan
2108 School of Education
Ann Arbor, Michigan 48109
(313) 764-9492

EDUCATIONAL MANAGEMENT
University of Oregon
Library, Room 108
Eugene, Oregon 97403
(503) 686-5043

ELEMENTARY AND EARLY CHILDHOOD EDUCATION
University of Illinois
College of Education
805 West Pennsylvania Avenue
Urbana, Illinois 61801
(217) 333-1386

HANDICAPPED AND GIFTED CHILDREN
Council for Exceptional Children
1920 Association Drive
Reston, Virginia 22091
(703) 620-3660

HIGHER EDUCATION
George Washington University
One Dupont Circle N.W., Suite 630
Washington, DC 20036
(202) 296-2597

INFORMATION RESOURCES
Syracuse University
School of Education
130 Huntington Hall
Syracuse, New York 13210
(315) 423-3640

JUNIOR COLLEGES
University of California
96 Powell Library Building
405 Hilgard Avenue
Los Angeles, California 90024
(213) 825-3931

LANGUAGES AND LINGUISTICS
Center for Applied Linguistics
3520 Prospect St., N.W.
Washington, DC 20007
(202) 298-9292

READING AND COMMUNICATION SKILLS
National Council of Teachers of English
1111 Kenyon Road
Urbana, Illinois 61801
(217) 328-3870

RURAL EDUCATION AND SMALL SCHOOLS
New Mexico State University
Box 3AP
Las Cruces, New Mexico 88003
(505) 646-2623

SCIENCE, MATHEMATICS, AND ENVIRONMENTAL EDUCATION
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, Ohio 43212
(614) 422-6717

SOCIAL STUDIES/SCIENCE EDUCATION
Social Science Education Consortium, Inc.
855 Broadway
Boulder, Colorado 80302
(303) 492-8434

TEACHER EDUCATION
American Association of Colleges for Teacher Education
One Dupont Circle, NW, Suite 610
Washington, DC 20036
(202) 293-2450

TESTS, MEASUREMENT, AND EVALUATION
Educational Testing Service
Rosedale Road
Princeton, New Jersey 08541
(609) 734-5180

URBAN EDUCATION
Teachers College, Columbia University
525 West 120th Street (Box 40)
New York, New York 10027
(212) 678-3437